British
airways

SUPER 1-11
OPERATIONS MANUAL
VOLUME 1

FLIGHT MANAGEMENT

British
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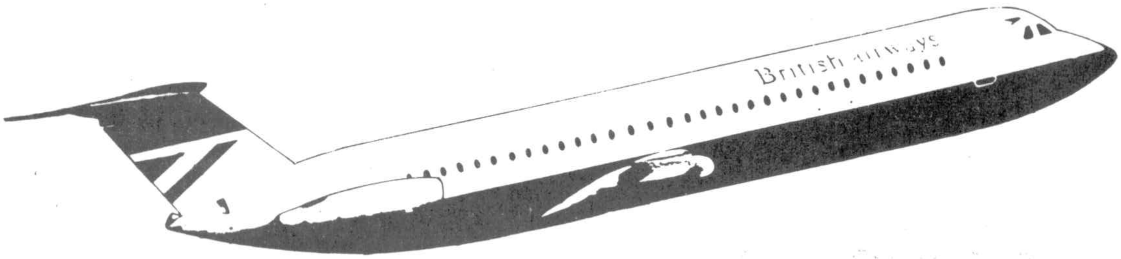

Super 1-11

Operations Manual volume 1

Flight Management

Approved Technical Publication No 871 Serial No
Prepared and issued by Technical Publications to
the Requirements of Engineering and Flight Operations

This manual complies with British Civil Airworthiness Requirements Section A, Chapter A6-7. The technical accuracy of the manual has been verified and is certified as correct.

Signed H. W. Owen. 15 May 1968
for Chief Project and Development Engineer, BEA.

A.R.B. Design Approval
No. AD/1160/48

The Operations Manual Vol. I consists of the following parts individually bound:

Pilots' Check List & Drills ...	ATP 870
Flight Management	ATP 871
Technical	ATP 872
Cabin Crew	ATP 873

British airways

APPROVED TECHNICAL PUBLICATION AMENDMENT

This revision complies with ANO (1980) Article 24 BCAR A6-7 CAP 360 and Technical Services Procedure T-DON-02-05

Approved Design Signatory F. Archer

Insert this sheet at front of manual. Destroy previous issue. Complete Amendment Record Sheet after amendment incorporation.

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SUPER 1-11 OPERATIONS MANUAL VOL. 1 - FLIGHT MANAGEMENT
(Approved Technical Publication No. 871)

August 1987

AMENDMENT LIST NO. 147

1. AMENDMENT RECORD SHEET

Check that AL. 146 has been recorded.

2. NEW AND REVISED PAGES

Remove & Destroy	Insert
ABNORMAL HANDLING	
Abnormal Handling	Revised page
" " 3/4	" "

AMENDMENT RECORD SHEET

Only Amendments issued by Technical Publications, Technical Support Services, British Airways, may be incorporated in this manual.

The incorporation of each Amendment List must be recorded below.

Amendment List		Incorporated By	Date Of Incorporation
No.	Date		
103	Aug 79	J. Oates	17-10-79
4			
5			
106	MAR 80		
107	APR 〃		
108	MAY 〃		

AMENDMENT RECORD SHEET Cont'd.

Amendment List		Incorporated By	Date Of Incorporation
No.	Date		

HANDLING - LIMITATIONS AND DIMENSIONS

Weights	Maximum taxying	41,950 kg.
	Maximum take-off	41,950 kg.
	Maximum landing	39,000 kg.
	Maximum zero fuel	35,381 kg.
Dimensions	Span	93 ft 6 in.
	Length	107 ft 0 in.
	Height	24 ft 6 in.
	Wing area (gross)	1031 sq. ft.
	Wheelbase	41 ft 5 in.
	Track (to u/c centres)	14 ft 3 in.
Speeds	Minimum V_1	95 kt IAS.
	V_{MO}:	
	ZFW exceeding 35,000 kg	323 kt IAS.
	ZFW 34,001 to 35,000 kg	325 kt IAS.
	ZFW 33,000 to 34,000 kg	330 kt IAS.
	ZFW less than 33,000 kg	333 kt IAS.
	M_{MO}	0.77 M_{IND}.
	If mach trim inoperative, unless autopilot fully serviceable and engaged	0.72 M_{IND}.
	High speed warning bell	336 to 345 kt, 0.775 to 0.79 M_{IND}.
	Bird collision speed	V_{MO}.
	Rough Air speed	280 kt IAS up to 28,700 ft. 0.72 M_{IND} above 28,700 ft.
	IAS for Holding in:	
	Light/moderate turbulence	240 kt below 39,000 kg. 250 kt 39,000 kg and above
	Severe turbulence	280 kt. (0.72 M_{IND} above 28,700 ft.)
	Max DV window opening speed	170 kt IAS.

Turning Radii with 20° Bank

210 kt at 5,000 ft	2.05 nm.
210 kt at FL250	3.55 nm.
325 kt at FL200	7.6 nm.
0.77 M_{IND} at FL280	8.7 nm.

Stalling

> Stalling is prohibited except for test or crew training purposes. Warning of approach to the stall is given by operation of the stick shakers. Stalling must not be carried out with CG further aft than 30% SMC. (When correctly loaded for training flights, take-off CG is at 20-22% SMC).

Stall warning (stick shake) and stall recognition (stick push) speeds are shown on Fig. 1; the following conditions apply:

Speed brakes - retracted
Undercarriage - up or down
Power - on or off
Centre of gravity - 30% SMC *
Rate of approach - 1 knot/sec.
Height - not greater than 15,000 ft.

* Stall speeds increase by 1½ kt per 10% forward shift of CG.

General

Maximum operating temperature - ISA + 30°C.
Maximum permissible altitude - FL 350
Minimum crew - 2
Max surface wind speed for opening front passenger or service doors - 50 kt
Aircraft must be parked into wind when surface wind speed exceeds - 50 kt

Maximum Pitch Attitude at touchdown, average rate of descent:

Bank Angle	Pitch attitude for Ground Contact
0°	11°
8°	11°
11°	0°

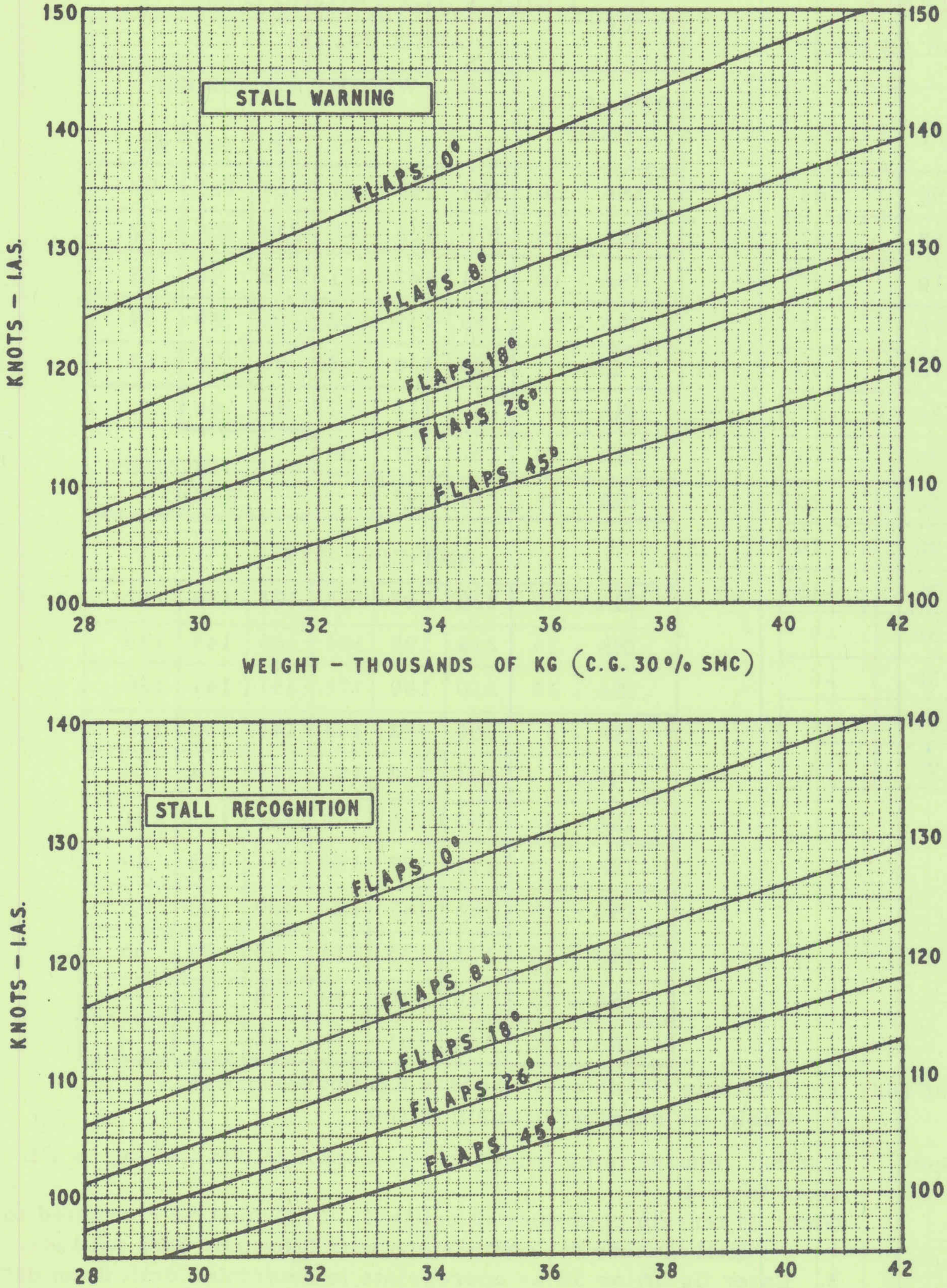


FIG. 1 STALL PROTECTION SPEEDS

TABLE 1

ISA AS IOAT

F/L	°C
350	-44
330	-41
310	-37
290	-34
270	-30
250	-27
230	-23
210	-20
190	-16
170	-13
150	-9
130	-6
110	-2
90	+2

TABLE 2 NET CEILING (FL)

- ANTICING ON						
RELATIVE TEMP	A/C WEIGHT - 1,000 KG					
	32	34	36	38	40	42
ISA - 20	189	166	147	129	113	97
ISA - 15	176	156	138	123	106	92
ISA - 10	166	147	131	115	98	85
ISA - 5	158	139	122	106	89	74
ISA	150	130	112	96	78	63
ISA + 5	139	119	101	85	66	
ISA + 10	127	107	88	ANTICING NOT REQD		
ISA + 15	114	92				
- ANTICING OFF						
ISA - 20	228	207	188	174	158	142
ISA - 15	218	198	181	166	149	135
ISA - 10	210	189	172	157	141	126
ISA - 5	200	182	164	148	133	118
ISA	194	174	156	139	124	110
ISA + 5	187	166	148	131	115	101
ISA + 10	177	157	138	121	105	89
ISA + 15	166	147	127	109	93	75
ISA + 20	155	135	114	95	77	56
ISA + 25	140	120	99	78	57	-
ISA + 30	124	101	78	53	-	-

Conditions:
1. En Route Climb speed at Max Continuous power.
2. Cabin air supplied by main engine.

Method: Extract relative temp from table 1. establish Net Ceiling as FL from table 2.

Note: If terrain clearance is critical. F/L must be converted to QNH altitude for comparison with Minimum Safe Altitude.

3. Enter fig 3A or 3B as appropriate to determine drift down data.

FIG. 2 ENGINE-OUT NET CEILING

Flight Level	ISA IOAT (210 kn)	WEIGHT - 1000 kg																		
		32			34			36			38			40			42			
		ISA -10	ISA	ISA +10	ISA -10	ISA	ISA +10	ISA -10	ISA	ISA +10	ISA -10	ISA	ISA +10	ISA -10	ISA	ISA +10	ISA -10	ISA	ISA +10	
350		33	36	39	35	38	41	37	40	43	39	42	45	41	44	46	44	45	47	min
	-44	145	160	180	160	175	190	170	185	200	180	195	210	190	205	215	200	215	225	nm
330		30	33	37	33	36	38	35	38	41	37	40	43	39	42	44	42	43	45	min
	-41	135	150	170	150	165	180	160	175	190	170	185	200	180	195	210	190	205	220	nm
310		27	30	34	30	33	36	33	36	38	35	38	41	37	40	42	40	42	43	min
	-37	120	140	155	135	155	170	150	165	180	160	175	190	170	185	200	180	195	210	nm
290		24	27	31	27	30	33	30	33	36	33	35	38	35	38	40	38	40	42	min
	-34	105	125	140	120	140	155	135	155	170	145	165	180	160	175	190	170	185	200	nm
270		20	23	27	24	27	30	27	30	33	30	33	36	33	36	38	36	38	40	min
	-30	85	110	120	105	125	140	120	140	155	135	150	170	145	165	180	160	175	190	nm
250		14	18	22	20	23	26	23	27	30	26	30	33	30	33	36	34	36	38	min
	-27	65	85	100	85	105	120	100	125	140	120	140	155	135	150	165	150	165	180	nm
230		7	12	17	14	18	22	19	23	26	22	26	30	26	30	33	31	33	36	min
	-23	35	55	75	65	85	100	85	105	120	100	120	140	115	135	155	135	150	165	nm
210			4	9	7	12	17	14	18	22	18	22	26	22	26	30	27	30	33	min
	-20		15	40	30	55	75	60	80	100	80	100	120	100	120	135	120	135	155	nm
190				1		4	9	6	12	17	12	17	21	18	22	26	23	26	30	min
	-16			5		10	40	25	50	75	55	75	100	80	100	120	105	115	135	nm
170							1		2	9	5	10	16	12	16	21	18	22	26	min
	-13						5		5	40	15	50	70	50	75	95	80	95	115	nm
150													8	2	9	15	11	16	21	min
	-9												35	5	45	65	50	70	90	nm
130																7		7	14	min
	-6															30		35	60	nm
110																			6	min
	-2																		25	nm

CONDITIONS: (A) ENGINE OUT EN ROUTE CLIMB SPEED AT MAX. CONTINUOUS POWER.
(B) CABIN AIR SUPPLIED BY MAIN ENGINE.

NOTES:

1. Time and distance to any intermediate flight level may be obtained by difference. Distance is shown to nearest 5 nm.
2. If terrain clearance is critical, F/L must be converted to QNH altitude for comparison with Minimum Safe Altitude.
3. IOATs shown are for ISA conditions at a typical drift down speed of 210 kt IAS.

FIG. 3A ENGINE OUT DRIFT DOWN. ANTICING ON - TIME AND DISTANCE IN STILL AIR TO 1000 FT ABOVE NET CEILING

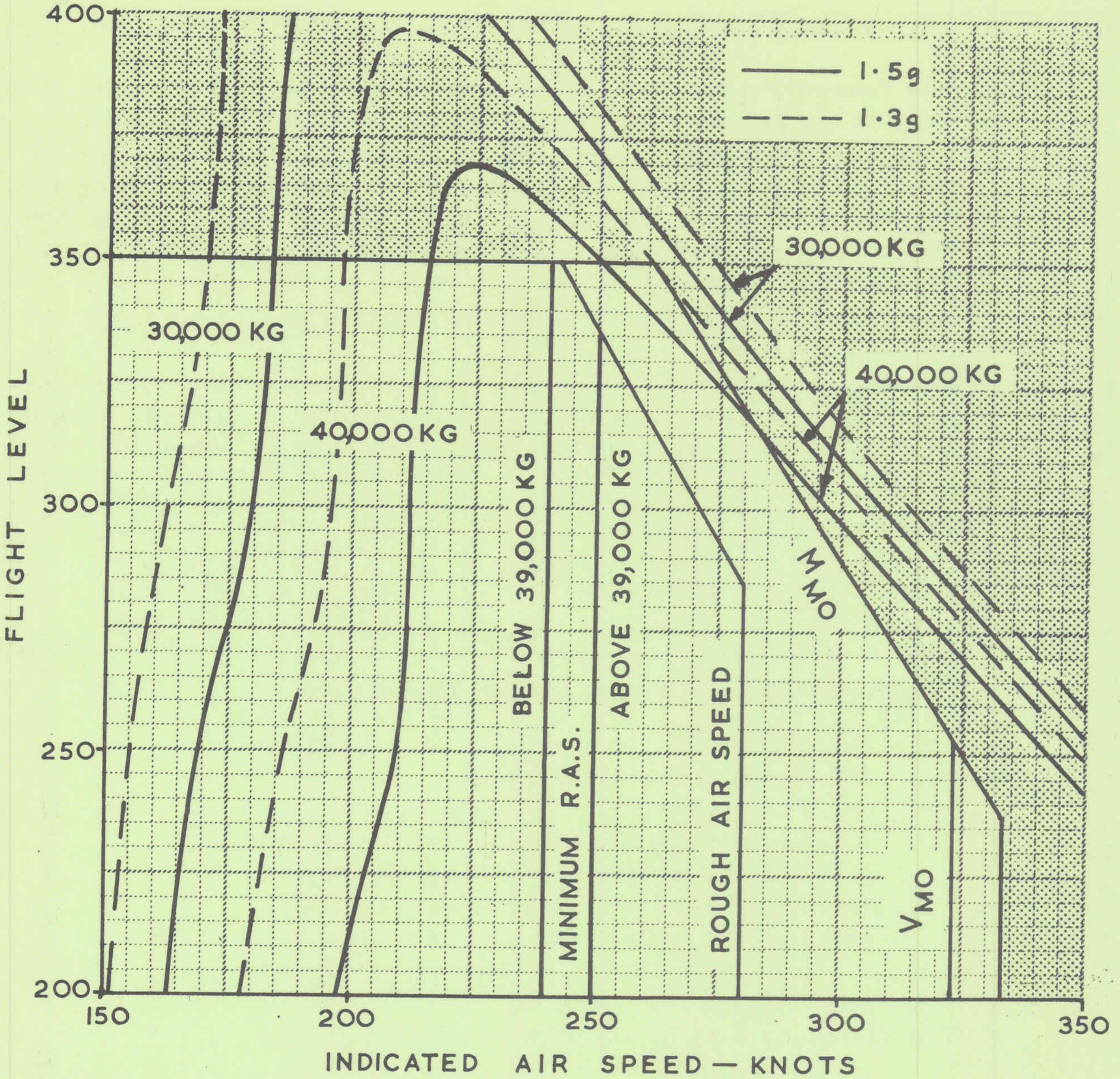
Flight Level	ISA IOAT (210 kn)	WEIGHT - 1000 kg																		
		32			34			36			38			40			42			
		ISA -10	ISA	ISA +10	ISA -10	ISA	ISA +10	ISA -10	ISA	ISA +10	ISA -10	ISA	ISA +10	ISA -10	ISA	ISA +10	ISA -10	ISA	ISA +10	
350		37	41	46	39	43	47	40	45	49	41	46	51	43	48	52	45	50	54	min
	-44	175	185	200	185	195	210	190	205	220	195	210	230	200	215	235	205	225	240	nm
330		35	39	43	37	41	45	38	43	47	39	44	49	41	46	50	43	48	52	min
	-41	165	175	190	175	185	200	180	195	210	185	200	220	190	210	230	195	215	235	nm
310		33	37	41	35	39	44	36	41	45	37	42	47	39	44	49	41	46	50	min
	-37	155	165	180	160	175	190	170	185	205	175	195	215	185	200	220	190	210	280	nm
290		31	35	39	32	37	42	34	39	44	35	40	45	37	42	47	39	44	49	min
	-34	140	155	165	150	165	180	155	175	195	165	185	205	175	190	215	180	200	220	nm
270		28	32	36	30	35	40	32	37	42	33	39	43	35	40	45	37	42	47	min
	-30	125	140	155	135	150	170	145	165	180	155	175	195	165	180	205	170	190	210	nm
250		24	29	33	27	32	37	29	35	39	31	37	41	33	38	43	35	40	45	min
	-27	110	125	140	120	140	155	130	150	170	140	160	180	150	170	195	160	180	200	nm
230		20	26	30	23	29	34	26	32	37	28	35	39	31	36	41	33	38	43	min
	-23	90	105	125	100	120	140	115	135	155	125	150	170	140	160	180	150	170	190	nm
210		14	21	27	19	25	31	22	29	35	25	32	37	28	34	39	31	36	41	min
	-20	65	85	105	80	105	125	95	120	145	110	135	155	125	150	170	140	160	180	nm
190		5	14	22	12	20	27	18	25	32	21	28	34	25	31	37	28	34	39	min
	-16	30	60	85	55	80	105	75	100	125	95	120	140	110	135	155	125	145	170	nm
170			6	15	4	13	22	10	19	27	16	24	31	21	27	34	25	31	36	min
	-13		25	60	20	55	85	45	80	105	70	100	125	90	115	140	110	135	155	nm
150				6		6	14	3	13	22	9	19	27	16	23	31	21	27	33	min
	-9			20		25	55	15	55	80	40	75	105	70	100	125	90	115	140	nm
130							6		5	14	1	12	22	9	18	26	16	23	29	min
	-6						20		20	55	5	50	80	40	75	105	65	95	120	nm
110										7		4	14		12	21	9	18	25	min
	-2									25		10	55		50	80	40	75	105	nm
90													7		2	14		12	20	min
	+2												30		0	60		45	80	nm

CONDITIONS: (A) ENGINE OUT EN ROUTE CLIMB SPEED AT MAX. CONTINUOUS POWER.
(B) CABIN AIR SUPPLIED BY MAIN ENGINE.

NOTES:

1. Time and distance to any intermediate flight level may be obtained by difference. Distance is shown to nearest 5 nm.
2. If terrain clearance is critical, F/L must be converted to QNH altitude for comparison with Minimum Safe Altitude.
3. IOATs shown are for ISA conditions at a typical drift down speed of 210 kt IAS.

FIG. 3B ENGINE OUT DRIFT DOWN. ANTICING OFF - TIME AND DISTANCE IN STILL AIR TO 1000 FT ABOVE NET CEILING



Max permitted cruising level is FL350 in both smooth air and severe turbulence.

FIG. 4 HIGH ALTITUDE LIGHT BUFFET BOUNDARY

MINIMUM RUNWAY LENGTHS FOR ABNORMAL LANDING SITUATIONS

The runway lengths obtained as described below are recommended minima for guidance in determining whether sufficient landing distance is available in the event of an abnormal landing situation arising whilst in flight (e.g. partial runway obstruction, reported extremely slippery surface conditions, an abnormal handling problem, etc) and when diversion to a more suitable airfield is impracticable. The lengths are approximately 15% shorter than those used to establish the maximum landing weight for flight planning purposes.

Weight 1000 kg	Runway Length Required - m
24	940
26	980
28	1020
30	1070
32	1110

Weight 1000 kt	Runway Length Required - m
34	1160
36	1210
38	1260
40	1300
42	1360

Conditions applicable to the above distances:-

(a) Still Air
(b) Airfield Elevation 300 ft.
(c) Flaps 45°
(d) Normal approach and threshold speeds.
(e) Normal landing and braking techniques.
(f) Use of reverse thrust on both engines.
(g) Runway surface dry or wet from normal rainfall and not classified as slippery when wet.

The distances may be adjusted as applicable by:-

1.	Headwind:	Subtract 10m per knot (up to 30kt)
2.	Tailwind:	Add 40m per knot (up to 20kt)
3.	Airfield Elevation:	12m per 300 ft above the datum 300 ft elevation.

4. When Braking Action reported poor (u = 0.25 or less), or the runway surface is extremely slippery (classified Slippery when wet, Heavy rain falling, wet ice or slush) speed should be reduced to VAT at runway threshold

and Emergency reverse maintained until the aircraft has stopped. An increase of up to 400m in landing distance can be expected under these conditions.

5. For a SINGLE ENGINE landing, using the technique of 26° flap and a maximum threshold speed of V_{AT} (26°) + 10 kn, the basic distances should be increased by 10%. Do not add any increment for Para 7 unless reverse thrust is inoperative on the live engine.

6. TOTAL BRAKE FAILURE: Assuming V_{AT} at R/W threshold and using Emergency Reverse Thrust until the aircraft has stopped, the increase in landing distance is approximately 500m.

7. THRUST REVERSER/S INOPERATIVE: If either one or both thrust reversers are inoperative the basic distance should be increased by 100m. This increment will be further increased when flap settings of less than 45° are used. Note that if (4), (8) or (9) also apply the combined effect could well double or even treble the basic landing distance.

8. LIFT DUMPER inoperative: Add 70m.

9. LIFT DUMPER AND SPOILER inoperative: add 150m.

10. REDUCED FLAP: add:

Setting°	0	8	18	26
Metres	500	400	300	200

GENERAL

If the available landing distance is only just sufficient, reduce speed to V_{AT} at the threshold.

Where system defects affect landing see Abnormal Handling page 15 and 16. For landings on slippery runways refer to Ice and Rain Protection.

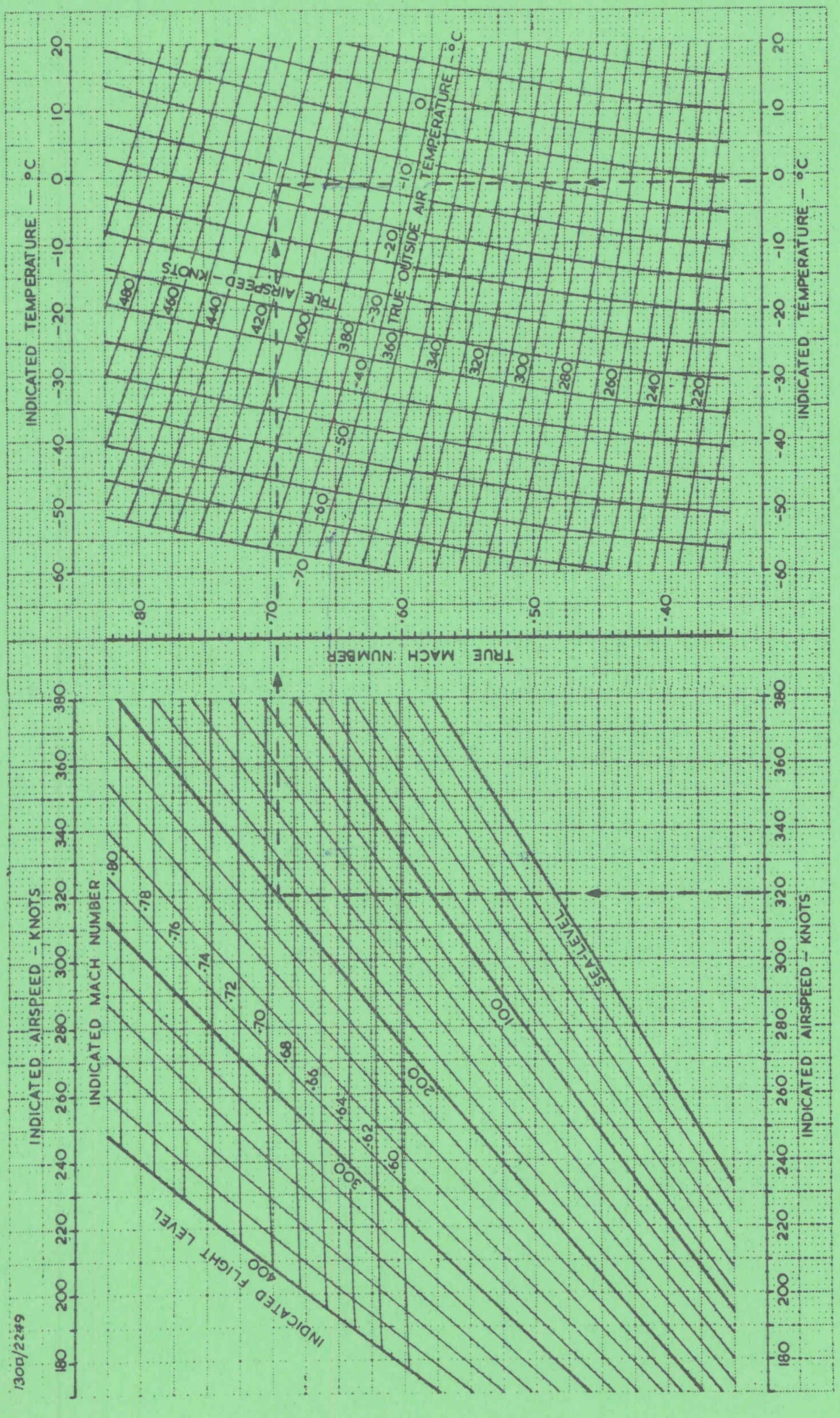


FIG. 5 IAS/TAS CORRECTION CHART

Shaded areas indicate conditions where Engine Limitations may become limiting.
Fuel flow may vary up to ± 100 kg.

FL	IOAT °C	32000 kg		34000 kg		36000 kg		38000 kg		40000 kg		42000 kg	
		IAS	kg/hr	IAS	kg/hr	IAS	kg/hr	IAS	kg/hr	IAS	kg/hr	IAS	kg/hr
350	-20	250	1000	239	950	221	900	-	-	-	-	-	-
	-30	261	1050	258	1050	250	1050	237	1000	222	1050	200	1100
	-40	261	1050	261	1100	261	1150	261	1200	261	1200	254	1200
330	-20	269	1100	263	1100	255	1100	244	950	221	850	-	-
	-30	273	1150	273	1150	273	1150	273	1200	270	1200	268	1200
	-40	273	1100	273	1150	273	1150	273	1200	273	1250	271	1300
310	-20	286	1200	283	1200	279	1250	274	1250	267	1250	256	1200
	-30	286	1200	286	1200	286	1250	286	1300	286	1300	286	1300
	-40	286	1200	286	1200	286	1200	286	1250	286	1300	286	1350
290	-10	290	1250	285	1200	231	1250	276	1150	269	1150	259	1100
	-20	299	1300	299	1300	299	1350	299	1350	296	1350	293	1350
	-30	299	1300	299	1300	299	1350	299	1350	299	1400	299	1450
270	-10	308	1350	305	1400	302	1400	299	1400	295	1400	290	1350
	-20	311	1350	311	1400	311	1400	311	1450	311	1450	311	1500
	-30	311	1350	311	1350	311	1350	311	1400	311	1450	311	1500
250	0	307	1350	304	1350	302	1300	298	1300	294	1300	290	1300
	-10	323	1450	323	1450	323	1500	323	1500	319	1550	317	1500
	-20	323	1400	323	1450	323	1450	323	1450	323	1500	323	1550
230	0	323	1400	323	1400	323	1450	319	1450	316	1450	314	1450
	-10	323	1400	323	1450	323	1450	323	1500	323	1500	323	1500
	-20	323	1400	323	1400	323	1450	323	1450	323	1450	323	1500
210	10	323	1400	322	1450	318	1450	314	1450	310	1500	307	1500
	0	323	1400	323	1450	323	1450	323	1450	323	1500	323	1500
	-10	323	1400	323	1400	323	1450	323	1450	323	1500	323	1500
190	10	323	1450	323	1450	323	1500	323	1500	323	1500	323	1550
	0	323	1400	323	1450	323	1450	323	1450	323	1500	323	1500
	-10	323	1400	323	1400	323	1400	323	1450	323	1450	323	1500
170	10	323	1450	323	1450	323	1450	323	1500	323	1500	323	1550
	0	323	1400	323	1450	323	1450	323	1450	323	1500	323	1500
	-10	323	1400	323	1400	323	1450	323	1450	323	1450	323	1500
150	10	323	1450	323	1450	323	1500	323	1500	323	1500	323	1500
	0	323	1400	323	1450	323	1450	323	1450	323	1500	323	1500
	-10	323	1400	323	1400	323	1450	323	1450	323	1450	323	1450
130	20	323	1500	323	1500	323	1500	323	1550	323	1550	323	1550
	10	323	1450	323	1500	323	1500	323	1500	323	1500	323	1550
	0	323	1450	323	1450	323	1450	323	1500	323	1500	323	1500
110	20	323	1500	323	1500	323	1550	323	1550	323	1550	323	1550
	10	323	1500	323	1500	323	1500	323	1500	323	1550	323	1550
	0	323	1450	323	1450	323	1500	323	1500	323	1500	323	1500
90	20	323	1500	323	1550	323	1550	323	1550	323	1550	323	1600
	10	323	1500	323	1500	323	1500	323	1550	323	1550	323	1550
	0	323	1450	323	1450	323	1500	323	1500	323	1500	323	1500
70	30	323	1550	323	1550	323	1600	323	1600	323	1600	323	1600
	20	323	1550	323	1550	323	1550	323	1550	323	1600	323	1600
	10	323	1500	323	1500	323	1550	323	1550	323	1550	323	1550

FIG. 6 NORMAL CRUISE CONDITIONS (ANTICING OFF)

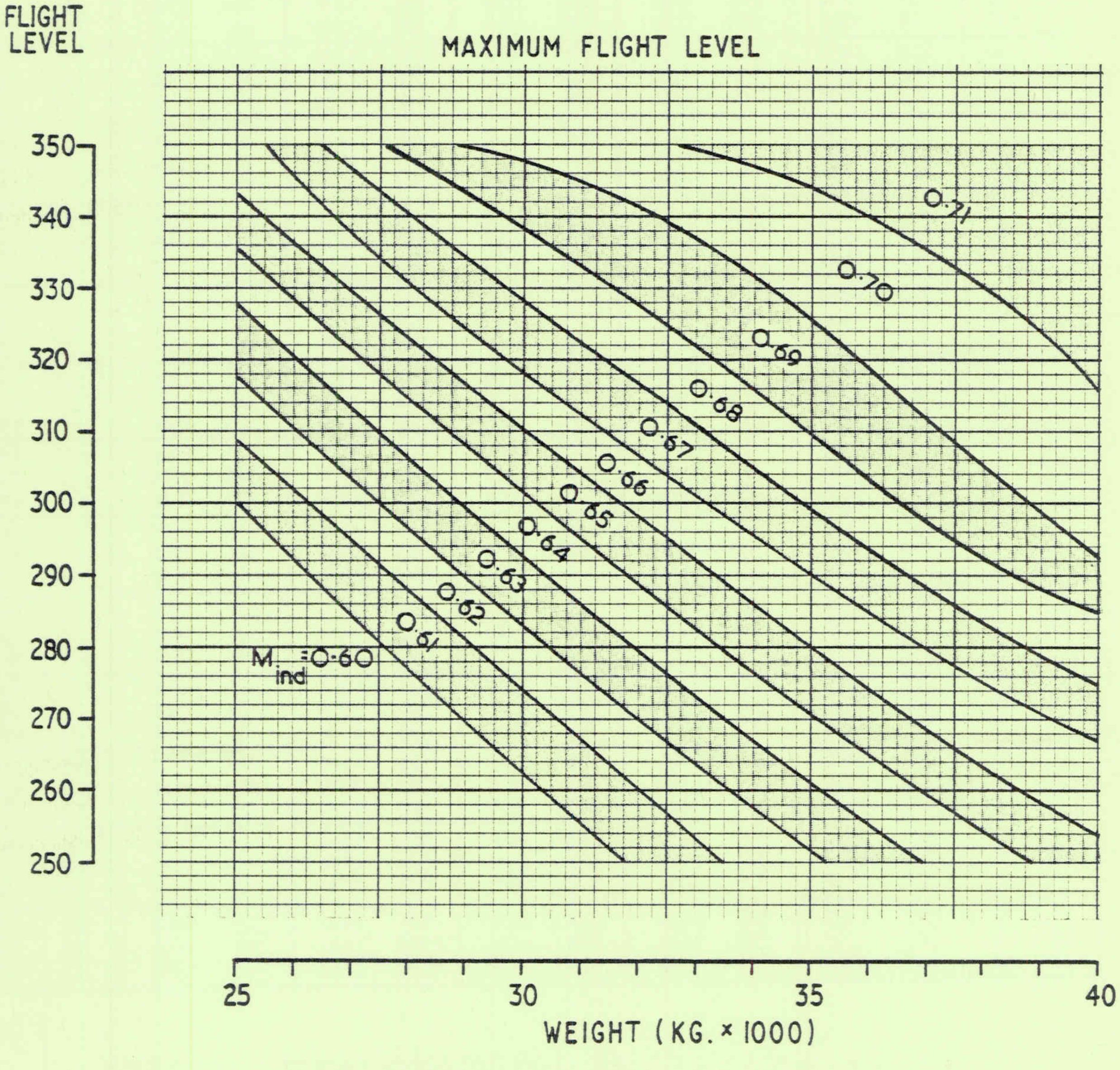


FIG. 7 CRUISE SPEED FOR 99% BEST RANGE

LEADING PARTICULARS & LIMITATIONS

Gen rating	30 kVA normal. 40 kVA 5 mins only.
Gen 1 & 2 frequency	392-408 c/s nominal. ACF defect action in Tech Log if outside these limits.
APU gen frequency	380-420 c/s.
Gen voltage	115V nominal.
TRU rating	150A
DC voltage	28V nominal.
Battery voltage	24V off load.
Nose lamp	Max extend or retract IAS 185 kts. Max speed with lamp extended, V_{MO} M_{MO}.
Wing lamp	Max speed with lamps extended, V_{MO} M_{MO}.

MWS OPERATION

Generator overheat

Generator failure

Battery isolated

DC Fail

Bus Fail

CIRCUIT BREAKER RAPID IDENTIFICATION

The circuit breakers listed below have coloured backgrounds to aid rapid identification.

Cb Title	Cb. No.	Panel	
Transformer Rectifier Unit No. 1	17	B	Orange
Transformer Rectifier Unit No. 2	18	B	
Service	128	B	
Toilet Exhaust Fan	81	B	
Landing Gear Warning	377	P	
DC Split	353	P	
AC Split	361	P	
Stall Prot No. 1 System	370	P	Pink
Stall Prot No. 2 System	351	P	
Pressurisation Control	53	B	Green
GPWS	483	RB	Orange Collar

AUTO LOAD SHEDDING
FLIGHT

Shed - With two generators on line.

Conditioning Fan if 2 AUX Pump is on -
Bar unit (fwd port) and all pantry supplies except No. 1 (fwd stbd) if the Conditioning Fan is on.

Shed - With one generator on line.

Conditioning Fan -
1 Aux Pump if 2 Aux Pump is on -
Bar unit (fwd port) and all pantry supplies except No. 1 (fwd stbd).

Available - With no generators on line, for approx 45 minutes, (see overleaf) only those systems listed in Total Generator Failure.

TOTAL GENERATOR FAILURE

If the 'DC Fail' warning light does not come on with total generator failure, trip the 'DC Split' cb (starboard console).

Recommended Action:-

Captain should take control and fly by reference to ASI, VSI, Turn & Slip & S. By Horizon, with P2 monitoring and giving headings from the E2B.

When safe flight is re-established, P2 should cancel MWS warnings and control pressurisation manually with the Air Dump Valve.

P2 should then continue with the Total Generator Failure Drills and should also continue to supply P1 with headings from E2B, monitor handling and select radio as required.

Blank off Attitude Directors & Flight Compasses as soon as possible.

/Cont'd. . . .

Battery endurance is about 45 minutes if fully charged. If an unsuccessful attempt to start the APU has been made, endurance is reduced to about 30 minutes.

The aircraft handles normally without Autopilot. Flying controls, speedbrakes, U/C (except retraction) steering, lift dump and braking are all normal except for some indicators.

If the failure occurs without prior warning shortly after take-off a large number of warning lights are presented, plus immediate reduction of flight instruments to the bare minimum. The most important losses are:-

Both Attitude Directors	Both RMI cards
Both Flight Compasses	Stbd Altimeter

The total generator failure drills are designed to cover the problems which would arise should there be an electrical failure at any stage of the flight. The drills are listed in the same order as the standard drill cards and items requiring action are indicated in heavy type. Those items where no action is possible due to the failure are indicated in light type. Reference is also made in the drills to the following notes:-

1. PRESSURISATION. The discharge valve fails shut, hence cabin pressure must be controlled manually until No. 1 MAIN busbar is restored. Manually open discharge valve as required. Disregard Cb53.

2. ANTICING. The only electrically heated anticing remaining is the port pitot head heater.

3. STALL PROTECTION. Because all vane heaters are lost, inadvertent operation of the stall protection system may occur in icing conditions. If necessary trip 'No. 1 Stall Protection' breaker on panel P.

AVAILABLE WITH ALL GENERATORS FAILED

INSTRUMENTS

Port Servo Alt
Port Turn & Slip
S. By Horizon
FL100 W/lt
S. By Alt)
P & S VSI's) Non-electric.
P & S ASI's) Stbd ASI no
E2B Comp) pitot heat.

FLAP

Posn Ind
Lowering sol
Emerg 18°

FLYING CTRLS

Trim tab posn ind
Servo pwr vlve MI
Lift dmp ctrl & MI
TPI Ind
Stall Ident syst 1
  ctrl & ind
Stall prot syst 1

AIR COND

Fuse duct fail w/lts
Isol vlvs & syst fail w/lts
ITCV posn & MV MI's
  (no temp varn poss)
DUCT & CAU o'ht w/lts
Dischge valve ind
  (valve optd man)
Safety & ram air vlvs
Cabin alt w/lt
Radio Fans Fail w/lt

ENGINES

Oil Press gauge
Oil Temp gauge
Oil LP w/lts
TVI's
Reverse u'lkd w/lts

FUEL

Quantity gauges
X feed cock & MI
LP cock & w/lts
APU fuel cock
APU fuel pump
Engine ctrl

ANTICING

Pitot htr port
1 valve per eng
Wing & Tail syst 1
  (no wing needle)
Tail & Duct syst 1
  press gauge

ELECTRICS

S. By Inverter
All gen fail w/lts
Bus fail w/lts
MWS & w/lts test
Ground pwr ctrl

ENG STARTING

Start master
1 & 2 HE Ign
APU start & ctrl

RADIO

VHF 1
ADF 1 (rel brgs)
CCS chan. A
C. Address

HYDRAULICS

System quant gauge
System press gauge
Brake acc p gauge
Hand brake p gauge
O'heat w/lts
LP w/lts
U/C w/lts & horn
DC pump
A/Skid (no test)

FIRE PROT

Eng zones 1 & 2 det
APU det
Fire bott shot 1 & 2
APU fire bott
Fire bott MI's
Fire bell
Fire & O'heat zone
  1 & 2 w/lts

LIGHTS

Nav
Emergency 1 & 2
Inst panel flood
Compass & Console
F Deck red flood
Cabin dim
ASI pillar port
  (with Storm sw on)
Stewards call

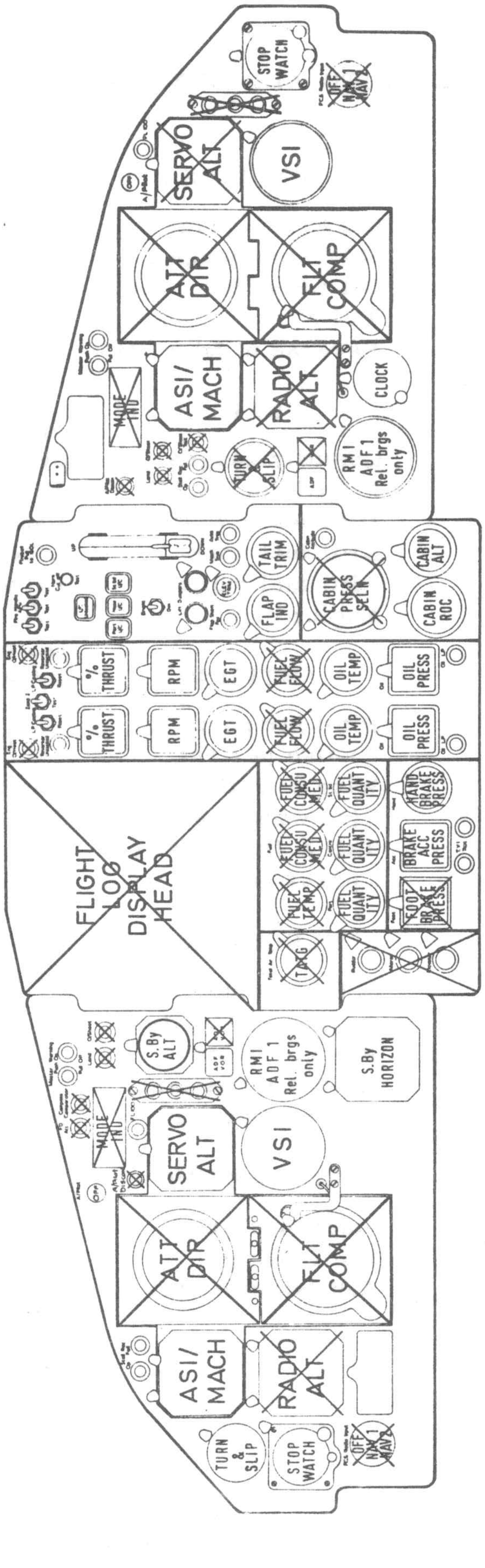


FIG.1 INSTRUMENTS AVAILABLE WITH ALL GENERATORS FAILED

TOTAL GENERATOR FAILURE DRILLS

AFTER TAKE OFF

1. U/C - UP IF REQUIRED: USE MANUAL OVERRIDE; RED LAMP ON
2. FIREBELL ISOLATION LAMP - IN
3. Landing Lamps - Inoperative. No speed restriction if fully extended.
4. Flight Director - Inoperative. Use S/By Horizon.
5. AIR CONDITIONING - No. 1 MASTER VALVE - OPEN

   ANTICING - IF REQUIRED, No. 1 WING & TAIL SWITCHES ON. No. 2 System & Wing temp gauge inoperative. Engine antice operative but not gauges.

   AIR DELIVERY VALVE - CLOSE
   No. 2 master valve and air cross-feed valve failed shut.
6. START/RELIGHT SWITCHES - OFF
7. 5 SECONDS - FLAPS & POWER AS REQUIRED. Power may be affected by loss of booster pumps.
8. PORT ALTIMETER - SET QNH OR 1013 (CROSS CHECK ALT OR FL) Starboard Servo Inoperative.

AFTER 3000 FEET

1. CLIMB POWER - SET

   'TTC' lost.

   Instruments Lost:- (See diagram)

   Fuel Flowmeters + Totalisers
   Fuel Temp Gauge

   Instruments Remaining:-

   Thrust Gauges
   RPM Gauges
   TGT Gauges
   Oil Press + Oil Temp Gauges
   TVI

2. FLAPS - UP - ZERO

3. Cabin Notices - Inoperative (Call System available)

4. U/C LAMPS - OUT

5. PRESSURISATION - CONTROL PRESSURE MANUALLY BY OPERATING AIR DUMP VALVE AS REQUIRED

   Cabin Selector inoperative

   No. 2 Air System lost

   Temp Control (Cabin & Flight Deck) inoperative. Cabin Temp Gauge lost

   Subsequent failure of No. 1 Air System would necessitate unpressurised flight. In that event:-
      Air Dump Valve Control fully open
      Ram Air Valve Switch open

6. No. 1 Aux Pump - Inoperative

7. SPEED BRAKE - COLLAR DOWN

8. TTC Switches - Inoperative

9. ALTIMETERS - CHECK/SET PORT & S. By TO 1013 AT TRANSITION ALT. Starboard Servo inoperative. (Cross check FL).

10. Fuel Transfer - Inoperative - fuel in centre tank lost

11. APU - Leave running

12. Interlock Failure Monitor - Inoperative

PRE-DESCENT

1. S.BY ALTIMETER - SET DESTINATION FORECAST QNH
2. SEATS AND HARNESS - LOCKED AND ADJUSTED
3. VITAL DATA - SET, CHECK SPECIAL PROCEDURES
4. BRAKE ACC PRESSURE - 2,800 PSI
5. ANTI-SKID - ON
6. Radio Altimeter - Inoperative
7. IFM Reset Button - Inoperative
8. Prime Land App. - Inoperative

DESCENT

1. Cabin Selector - Inoperative. Control pressure manually
2. Booster Pumps - Inoperative

   CROSSFEED COCK - SHUT

   Transfer Pumps - Off - Inoperative

   Transfer Cocks - Failed Shut
3. FUEL - CONTENTS - DIVERSION REQUIREMENT. FUEL IN CENTRE TANK CANNOT BE USED

BELOW FL150

1. ALTIMETERS - SET BOTH QNH WHEN CLEARED TO ALTITUDE (CROSS CHECK) (Starboard Servo inoperative)
2. SPEED BRAKE - COLLAR UP
3. TTC Switches - Inoperative
4. APU - CHECK AT RUN

STOP HERE IF HOLDING

- -

5. ALTIMETERS - CHECK/SET PORT SERVO & S. BY TO QNH BY TRANSITION LEVEL (CROSS CHECK) (Starboard Servo inoperative)
6. FCS - Inoperative
7. SPEED BRAKE - IN
8. FLAPS - 18°
9. Fan Intake Shutters - Inoperative shut
10. No. 1 Aux Pump - Inoperative
11. Cabin Notices - Inoperative (Call System available)
12. ALTIMETER - SET PORT SERVO TO QFE (CROSS CHECK ELEVATION) Starboard Servo inoperative
13. AIR CONDITIONING - DEPRESSURISE. No. 1 MASTER AIR VALVE CLOSE - RAM AIR VALVE OPEN
14. Omnitrac/FCS Controller - Sensor Selector - Off (inoperative)

APPROACH

1. UNDERCARRIAGE - DOWN, 3 GREENS
2. BRAKE PRESSURES - HAND ZERO
   'Foot' gauge inoperative

   USE NORMAL BRAKING TECHNIQUE ON LANDING
3. Radar Standby (Inoperative)
4. ALTIMETERS SET S. BY QFE (cross check) EXCEPT FOR QNH SRA

FINAL APPROACH

1. STEWARD'S REPORT - RECEIVED. Notices inoperative
2. ANTICING - ENG. AS REQD; AIRFRAME OFF
3. START/RELIGHT SWITCHES - AS REQUIRED
   No. 2 igniter on each engine inoperative
4. Fasten seat belts - Inoperative
5. FLAPS - FINAL APPROACH SETTING

OVERSHOOT

1. FULL POWER - SET SLOWLY. May be affected by inoperative booster pumps
2. ATTITUDE AND SPEED - ESTABLISH (S. BY HORIZON AND PRIMARY INSTRUMENTS ONLY)
3. FLAPS - 18°
4. U/C - MANUAL OVERRIDE - UP ONLY IF TERRAIN CLEARANCE CRITICAL
5. ALTIMETERS - SET PORT AS REQD., S. BY TO QNH

IF DIVERTING - Continue with After Take-Off and After 3000 ft drills as necessary.

FURTHER APPROACH

8. AIR COND. ANTICING - AS REQUIRED
9. VITAL DATA - CROSS CHECK

Continue with Below FL150 drills from item 5

LANDING

1. LIFT DUMPERS - SELECT - CHECK INDICATORS
2. REVERSE THRUST - SELECT - LAMPS ON
3. ANTI SKID - OFF AT TAXYING SPEED

SUMMARY OF SERVICES NOT AVAILABLE FOLLOWING ELECTRICAL SMOKE/FIRE DRILLS

Power Situation	Powered	Some Important Services NOT AVAILABLE	Nav/Comms NOT available
(A)	Essential DC Essential AC Battery DC	Refer Flt Management Electrical 3 - 12	
(B)	1 Main AC Essential AC Essential DC) Battery)	Stbd altimeter Stbd T & Slip Booster pumps 1 each side Stbd Q pitot heater Stbd pitot heater Aux hyd pump 1 Autopilot	Transponder W. Radar. VHF 2 Glide Path 2 Markers ADF 2 DME 2
(C)	2 Main AC Main DC	Fuel LP cocks Fuel Contents gauges Boost pmps 1 each side Emerg elevator Lift dumpers Flap posn ind Aux hyd pump 2 Anti skid Att. comparator Autopilot Ice det Port Q pitot htr Port pitot htr Port altimeter Port T & Slip S.By Horizon Pressn auto Fire detectors U/C W/lights APU	VHF 1 Nav 1 ADF 1 GP 1
(D)	1 Main AC 2 Main AC AC Essential DC Main DC Essential DC Battery		
(E)	All except 1 main AC	Booster pumps 1 each side Aux hyd pump 2 Port Q pitot heater Pressurisation auto Autopilot Conditioning fan	

GENERATOR OVERHEAT

Symptom	Gen overheat w/l on.
Action	Check gen voltage, frequency and kVA. If normal - monitor for rest of flight. If abnormal - 1. Start APU if not running 2. Trip relevant generator 3. Check APU gen volts frequency kVA. 4. If overheat w/l goes out within 5 mins Reset generator if required due to other failures but trip again if w/l returns If w/l still on after 5 mins Disconnect relevant CSD or shut down APU.

BUS FAIL W/L ON

Symptom	AC Bus fail w/l on
Action	Check gen volts freq and kVA. If normal - monitor for rest of flight. If abnormal - 1. Start APU if not running. 2. Trip relevant generator. 3. Check APU gen volts freq and kVA.

AC BUS FAILURE

Symptom	AC Bus and Gen fail w/l on alternately.
Action	Trip relevant generator.

All systems except FCS and Radio, fed from the failed Main AC Bus (1 or 2) are lost. These are listed in the Technical Manual Electrical section.

All FCS and Radio supplies remain normal although the amber power failure warning lamps will be on if 1 Main AC Bus has failed.

NOTE: If the other generator now fails, the APU will not take over.
See Total Generator Failure.

FAILURES

APU GEN FAIL W/LT ON &
APU GEN O/HEAT W/LT ON
(APU running, Gen 1 and/or 2 already failed).

Check Battery switch On
Stop APU -
Cancel MWS -
See 'Auto Load Shedding' and 'Total Generator Failure' on page 1.

APU GEN FAIL W/LT ON
(APU running, Gen 1 and/or 2 already failed).

Check Battery switch On
Reset generator once only. If failure remains -
Cancel MWS
See 'Auto Load Shedding' and 'Total Generator Failure' on page 1.

APU GEN O/HEAT W/LT ON
(APU running, Gen 1 and/or 2 already failed).

Cancel MWS -
If APU Gen voltage, frequency & kVA normal, monitor for remainder of flight. If abnormal -
Check Battery switch On
Trip APU Gen -
See 'Auto Load Shedding' and 'Total Generator Failure' on page 1.

1 & 2 GEN FAIL W/LTS ON &
BUS FAIL W/LTS ON &
DC FAIL W/LT ON &
APU GEN FAIL W/LT ON
(APU not running)

Check Battery switch On
Reset 1 & 2 Gens. If failure remains -
Make one attempt to start APU. If unsuccessful, treat as total generator failure and see page 1. Otherwise -
Cancel MWS -
Check APU gen voltage, frequency & kVA-
Check 'Bus Fail', 'DC Fail' & APU 'Gen Fail' w/lts out.
Push in all w/lts except 1 & 2 'Gen Fail' -
See 'Auto Load Shedding', above.

1 OR 2 GEN FAIL W/LT ON &
1 OR 2 GEN O/HEAT W/LT ON & (APU not running)
APU GEN FAIL W/LT ON

Disconnect relevant CSD -
Start APU -
Cancel MWS
Check APU gen voltage, frequency & kVA -
Push in APU 'Gen Fail' w/lt.

1 OR 2 GEN FAIL W/LT ON &
APU GEN FAIL W/LT ON (APU not running)

Check (1 or 2) gen voltage, frequency & kVA to confirm failure.
If readings normal, cancel MWS and disregard warning but monitor output. If failure confirmed -
Reset generator once only. If failure remains -
Start APU -
Cancel MWS -
Check APU gen voltage, frequency & kVA -
Push in APU 'Gen Fail' w/lt.

1 OR 2 GEN O/HEAT W/LT ON

If suspect generator voltage, frequency & kVA normal, monitor for remainder of flight.

If generator voltage, frequency or kVA abnormal -
Trip relevant generator -
Start APU if not running -
Cancel MWS -
Check APU gen voltage, frequency & kVA -
Push in APU 'Gen Fail' w/lt if necessary -
If O/HEAT w/lt goes out within 5 mins -
Reset generator if required due to other failures but Trip again if w/lt returns -
If w/lt still on after 5 mins -
Disconnect relevant CSD.

BUS FAIL W/LT ON

Cancel MWS -
If associated gen voltage, freqn and kVA normal,
disregard w/lt.

If not -
Trip relevant generator -
Cancel MWS -
Start APU if not running.
Check APU gen voltage, frequency & kVA -
Push in APU 'Gen Fail' w/lt if necessary.

GEN FAIL W/LT
BUS FAIL W/LT ON ALTERNATELY - AC BUS FAILED

Trip relevant generator -
Cancel MWS -

All systems, except FCS & Radio, fed from the failed Main AC Bus (1 or 2) are lost. These are listed in the Technical Manual Electrical section.

All FCS & Radio supplies remain normal although the amber Power Failure warning lamp will be on if 1 Main AC Bus has failed.

DC FAIL W/LT ON, ALL READINGS NORMAL

Check 'DC Split' cb on panel P.
If not tripped, no further action.

DC FAIL W/LT ON & TRU AMMETERS ZERO

Check 'Transformer Rectifier Units No. 1, No. 2' cb's on panel B inboard face.

If neither is tripped or they will not reset, the Main DC Bus and Sub Bus Bars are lost. The Essential DC and Battery Bus Bars and Sub Bus Bars remain available for approx 45 minutes.

EITHER TRU AMMETER ZERO, ALL SYSTEMS NORMAL

Check relevant 'Transformer Rectifier Units No. 1, No. 2' cb's on panel B inboard face.

LEADING PARTICULARS AND LIMITATIONS

Tank	Port	Centre	Starboard	Total
Usable capacity	4050 kg 1125 gal	3078 kg 855 gal	4032 kg 1120 gal	11,160 kg 3100 gal

The contents gauges are calibrated to show usable fuel.

Minimum fuel for take-off - 2200 kg, divided equally between wing tanks.

Maximum fuel asymmetry for take-off - 500 kg.

Fuel specification - DERD 2494 or DERD 2453
TC1 (in USSR only).
TSZ-1 (Budapest only).
PL5, PL6 (Prague only).
T1 (Bucharest or Constanza only).
PS2 Kerosine (Cracow only).

Fuel specific gravity - 0.7936
(1 Imp gal = 3.6 kg).

Maximum engine fuel temperature,
Continuous - +90°C.
Up to 15 minutes - +110°C.

Maximum fuel asymmetry for landing (e.g. fuel leak) - 2000 kg.

With maximum crosswind component - 20 kt.

Fuel loading if unable to fill one wing tank - See Vol.I Technical, Fuel System - Ground Servicing, Preliminaries.

MWS FUNCTIONS

Red - Booster Pump LP, via 3-7 second delay circuit.

Amber - Transfer LP.
Engine Low Pressure.

ABNORMAL MANAGEMENT

FUEL SYSTEM

BOOSTER PUMP FAILURE

Symptoms - 1. Booster pump LP warning lamp On.
2. Red MWS.

Action - 1. Booster pump switches - both On, affected tank.
2. Booster pump CB's - Check. Do not reset if tripped.

If warning lamp remains on:
3. Crossfeed cock - Open.
4. Lamp goes out - both pumps in tank have failed.
Lamp remains on - pressure switch failed.
Use normal fuel management, ignore warning.
5. Crossfeed cock - Shut.
6. If the associated Engine LP warning lamp comes on, and/or engine malfunctioning occurs - reduce power/descend.

With both pumps inoperative, the engine backing pump will maintain satisfactory fuel delivery by suction - feeding at and below FL180, but less than full power may be obtained from the affected engine.

If a rear pump is known to be inoperative, sustained nose-up attitude in excess of 10° held for more than 30 seconds can cause a flame-out if the tank content is less than 700 kg, and the Engine LP warning lamp may flicker on; in the landing attitude the unusable fuel content is increased.

TRANSFER PUMP FAILURE

Symptoms - 1. Transfer LP warning lamp on before transfer is complete.
2. After 4 seconds, amber MWS flashing.

Action - 1. Other transfer pump - On.
2. Transfer pump CB - Check. Do not reset if tripped.
3. Check transfer LP warning lamp - Out.
4. Failed pump - Off.

If both transfer pumps fail, fuel remaining in centre tank will be unusable.

FUEL FAILS TO TRANSFER

Symptoms -

1. One or both transfer cocks selected open.
2. One or both transfer pumps on and Trans LP lamp out.
3. Fuel not transferred to wing tank(s).

Action -

1. Transfer cock switches - both Off.
2. Transfer pumps - both On.
3. Transfer cock switches - select one to On. Check fuel transfer - Off.
   Repeat with other cock.
4. If stuck cock(s) open - proceed normally.
   If cock(s) still inoperative - repeat actions 1-3 at frequent intervals.

NOTE: If one cock can be opened, feed centre-section fuel to associated tank, and crossfeed from that tank until transfer is complete and fuel symmetry restored.

ENGINE LP PUMP FAILURE

Symptoms -

1. Engine LP warning lamp on.
2. After 4 seconds, amber MWS flashing.

Action -

1. Both booster pumps on affected side - On.
2. Engine LP warning lamp - Pull.
3. No effect on engine power provided booster pumps maintaining delivery pressure.

ENGINE FAILURE

Action - 1. Maintain fuel symmetry by using crossfeed cock and booster pumps as necessary (Maximum asymmetry on landing - 2000 kg).

INTERMITTENT TRANSFER

Symptom - Flickering of transfer cock indicator(s) at high altitude with only one transfer pump on.

Action - 1. Second transfer pump - On.

If only one transfer pump available:
1. One transfer cock - Close.
2. Maintain fuel symmetry by selecting port and starboard transfer cocks alternately.

LOW FUEL CONTENTS

Either wing tank contents below 700 kg.
See BOOSTER PUMP FAILURES.

Either wing tank contents below 350 kg:

Action - 1. Booster pumps - All on.
2. X-feed cock - Open.
3. Change attitude as smoothly as possible, avoid extreme attitudes.

FUEL LEAK

Wing Tank/Engine Supply

Fast Leak:

1. Shut down engine, affected side.
2. Booster pumps, affected side - Both Off.
3. Crossfeed cock - Check Closed.
   Continue flight to nearest suitable airfield. If essential to use fuel in affected tank to ensure safe landing, complete actions 1 to 6 of the Slow Leak drill.

Slow Leak:

1. Booster pumps - All On.
2. Crossfeed cock - Open.
3. Booster pumps, unaffected side - Both Off.

When unaffected tank contents sufficient for landing, or affected tank contents below 350 kg, whichever soonest:

4. Booster pumps - All On.
5. Crossfeed cock - Leave Open. If Engine affected side shut down (fast leak) - CLOSE.
6. Booster pumps, affected tank - Off.
   Monitor consumption/loss rate carefully, ensure adequate fuel for landing, divert if necessary, If loss rate increases, treat as fast leak.

Centre Tank - Fast or Slow Leak:

1. Complete fuel transfer.
2. Check Fuel state.

NOTES: A fast leak in a tank/engine supply might be signalled by symptoms of fuel starvation on that side. A slow leak might be initially masked by fuel transfer.

If possible, avoid landing with wing to wing fuel asymmetry exceeding 2,000 kg, and with a crosswind component exceeding 20 kt at this level of asymmetry.

Any violent manoeuvre or encounter with severe turbulence could increase the rate of fuel loss.

R.R. SPEY 512-14E

NORMAL POWER

The following ratings should be used in normal circumstances, as recommended in 'Flight Handling':

RATING	RPM		TGT °C
	HP	LP	
Ground Idle	7,600 ± 200	-	560
Take-off (5 minutes)	12,800	9,000	600
Normal Climb	12,000	9,000	505
*Operational Necessity Climb	12,150	9,000	510
Cruise	11,850	9,000	485
Minimum Approach: Full Air Offtake - No Offtake -	 10,000 8,000		
Normal Reverse (30 sec)	11,750	9,000	485

EMERGENCY POWER

For use in abnormal/emergency circumstances only at Captain's discretion:

*Full Power (5 minutes)	12,800	9,000	600
*Max Continuous	12,500	9,000	560
Emerg Reverse (30 sec)	12,800	9,000	590

*Duration and reason for use must be entered in the Technical Log. When full power is used, the 5 minute limitation includes time spent at take-off power.

REVERSE THRUST

Reverse thrust shall not be selected in flight, and must not be selected for ground manoeuvring or testing except for the normal taxying check (see Check Lists & Drills) or emergency retardation.

TRANSIENT CONDITIONS

CONDITION	RPM		TGT °C
	HP	LP	
Start	-	-	600 (2 sec)
Relighting	-	-	600 (2 sec)
Max Overtemp during take-off	-	-	620 (20 sec)
Overspeed (20 sec)	13,290	9,270	-

OIL SPECIFICATION

- See Ground Servicing, Engines section, Vol. 1, Technical.

OIL TEMPERATURES

Max Permissible - +120°C for 15 min.
Max (Continuous operation) - +100°C
Min for Starting - - 40°F/c
Min for Acceleration - - 30°C
Min for Relighting - - 40°F/c

OIL PRESSURES

Min acceptable before Take-off - 40 psi at take-off rpm. (-30°C)
Low Pressure warning - 15 psi
Minimum In-Flight Oil Pressure:

HP rpm	Oil Pressure (psi)
10,000	24
11,000	28
11,850	32
12,000	33
12,500	35

MWS FUNCTIONS

Red - Low oil pressure.
Engine o'heat.

RELIGHTING

A relight may be attempted at any point within the normal flight envelope, using the drill appropriate to the IAS. If this relight fails, the next attempt should be made when the aircraft is within the recommended relight envelope (refer Fig. 1). Unless operationally essential, avoid relighting between 215 and 225 kt IAS; should a relight between these speeds fail repeat using the alternative drill.

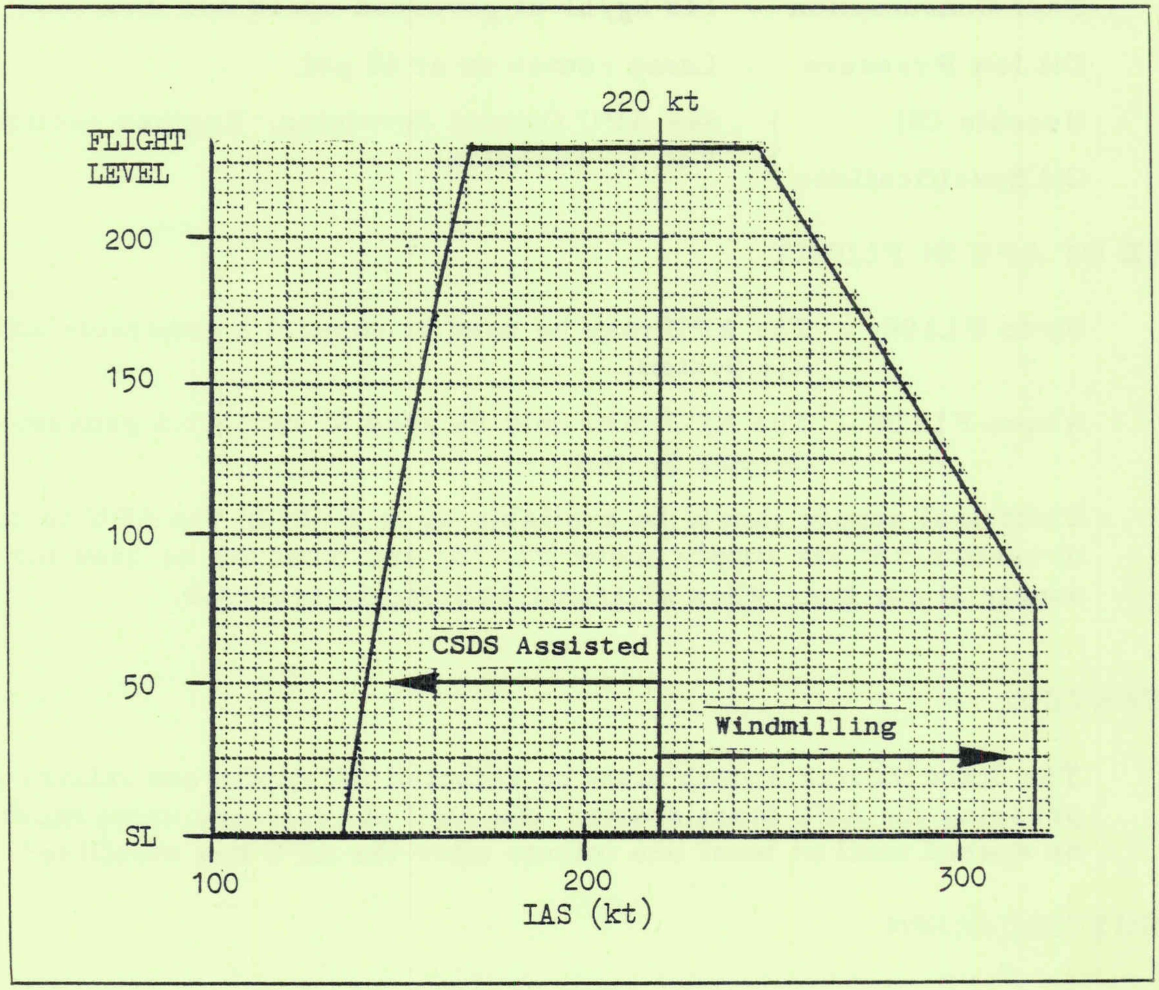


Fig. 1 R.R. SPEY RELIGHT ENVELOPE

AUXILIARY POWER UNIT
AiResearch GTCP-85-115C

EGT Limitations (Mk5 identified by label on EGT gauge)

CONDITION	Mk2	Mk5	Time
Starting	760	760	15 seconds
Governed speed on load	710	570	Unlimited
Max Overtemp	760	710	5 seconds

Fuel Consumption - 145 kg/hr at governed speed and max load.

Oil low Pressure - Lamp comes on at 48 psi.

Useable Oil)
Oil Specifications) See APU Ground Servicing, Engines section, Vol. 1, Technical.

USE OF APU IN FLIGHT

Up to FL100 - The APU may be used to support a generator and the Air System.

Above FL100 - The APU may only be used to support a generator OR the Air System.

Electrical supply should be available up to FL350; the APU is unlikely to sustain full air supply above FL170, and must not be used for air supply at any time when airframe anticing is required.

STARTING

The Start Master switch must be selected Off within one minute of pressing the APU Start switch; the APU air delivery valve must not be opened until at least one minute after the APU has stabilised.

SHUTTING DOWN

Except in emergency, the APU must be run for one minute without air off-take before shut-down.

When using the APU as essential equipment, the following limitations apply:

1. The maximum altitude is FL350, but full air supply is only available up to FL170.

2. A water drain check of the left wing tank must be made before each take-off

3. The planned flight time between refuelling must not exceed 3½ hours.

4. The generator frequency selector must be left switched to APU GEN, except when checking an engine generator, and the fire AUTO/MANUAL switch to MANUAL.

APU OPERATION

Air Off-take

The APU must be allowed to run for one minute without air off-take, at governed speed, before opening the air delivery valve: the APU should be run for one minute before shut-down with no air off-take, unless circumstances dictate otherwise.

Starting - The Start Master switch must be returned from APU to Off within one minute of initiating an APU start.

Ramp Safety Procedures

When the APU is running, a pilot or engineer must remain on the flight deck at all times when passengers are embarking, on board, or disembarking.

Restarting Prior to Landing

The APU must be started prior to landing if the destination temperature exceeds 25°C or the elevation exceeds 2,200 ft. or the cloud base is approaching circling minima.

RELIGHTING

A relight may be attempted at any point in the aircraft operating envelope, provided at least one main generator is on line; if the first attempt fails, the second should be made within the recommended relight envelope.

/Cont'd. ...

In the event of only battery power being available, only one attempt at relight shall be made; this attempt must be made within the relight envelope, and the start cycle limited to a duration of one minute.

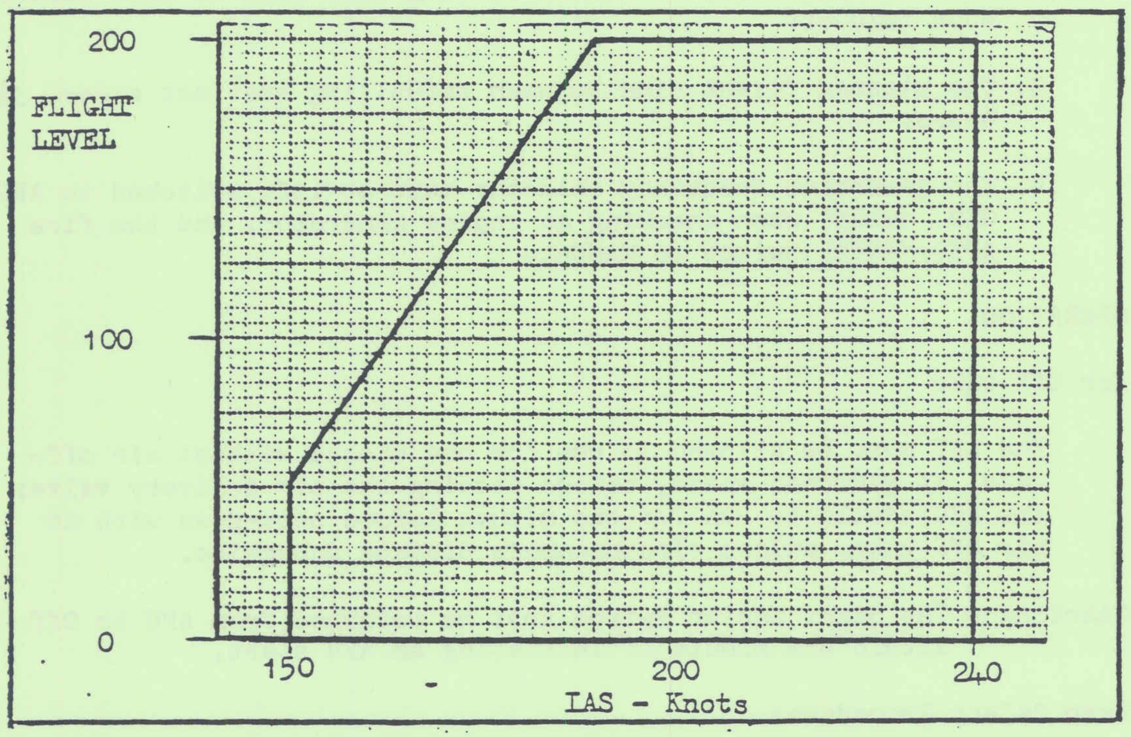


FIG. 2 APU RELIGHT ENVELOPE

FAILURE TO START

Symptoms (a) - 1. No HP rpm indications.
2. Shaft rotation lamp fails to come on.

Action - 1. HP cock - check Shut.
2. Ignitor lamps - check.
3. Start Master swich - Off, check ignitor lamps Out.
4. Air valves - check correct selections.
Duct pressure - check 35-40 psi.
5. Engine start and ignitor CBs - check, re-set.
6. Repeat normal starting drill.
7. Attempt fails - suspect air supply valves.

Symptoms (b) - 1. HP rpm indication.
2. Shaft rotation lamp fails to come on.

Action - 1. Start Master switch - Off, check ignitor lamps Out.
2. HP cock - check shut.
3. Check engine manually for free rotation of LP shaft.
4. Engine rotates freely - repeat normal start drill, opening HP cock when LP rpm indicated.

Symptoms (c) - 1. Shaft rotation lamp flickers.
2. HP rpm indication.
3. No TGT indications within 10 sec of opening HP cock.

Action - 1. HP cock - Shut.
2. Start Master switch - Off, check ignitor lamps Out.
3. Ignitor CBs - Check, re-set.
No. 1 eng - B364, panel P, B112 panel B.
No. 2 eng - B365, panel P, B113 panel B.

Wait 3 minutes for fuel drainage.

/Cont'd. ...

4. Start/Relight switch - Relight, check lamps and ignitor units (aurally).

If ignitors functioning only at Relight:

5. Start Master switch - On.
6. Start/Relight switch - Start (2 sec) then Relight.
7. Complete starting procedure, switching relights off as generator comes on line and shaft lamp goes out.

Symptoms (d) - 1. HP rotation, LP Shaft lamp flickering.
2. TGT indications, possibly excessive.
3. No acceleration.

Action - 1. HP cock - Shut.
2. Start Master switch - Off, check ignitor lamps Out.
3. Monitor TGT during shut-down.
4. Engineer's check prior to further start.

Symptoms (e) - 1. Shaft rotation lamp remains on after acceleration.

Action - 1. Check all other engine indications normal.
2. Generator - Check.
3. Start Master switch - Off, check shaft lamp goes out.

If other engine not started:

4. Before starting check manually for free rotation.
5. Start Master switch - On, shaft lamp may come on.
6. Complete normal start sequence, checking shaft lamp goes out as Start Master switch selected Off.

MOTOR-OVER

Action - 1. HP cock - 'Shut'.
2. Start Master switch - 'Motor'.
3. Start/Relight switch - 'Start and Motor' momentarily.
4. Start Master - 'Off' after 30 sec.
5. Allow starter and engine to stop rotating before attempting another start.

ABNORMAL STARTING

TAIL WIND START (operationally unavoidable)

Complete the normal starting drill, except:

HP cock lever	Start when LP rpm indicated on gauge.

EXTERNAL AIR SUPPLY

Either or both engines may be started from an external air supply, using the internal batteries (without load shedding) if this is necessary.

If both engines have to be started from an external air bottle supply, start the No.2 engine and then use the cross-feed procedure to start the No.1 engine; this will minimise the risk of frozen air valves.

The procedures differ from the normal technique where marked with an asterisk.

When clear to start:

	Beacon	On.
	Hydraulic pumps	Off.
	Master valves	Closed.
*	Air delivery valve	Closed.
*	Air crossfeed valve	Closed.
*	External air supply	Connected, duct pressure 35/40psi.
	Isolation valves	1 closed, 2 open.
	Stbd booster pumps	On.
	Engine generators	Trip.
	Frequency/Volt selector	Generator 2.
	Start master switch	Start.
	Engine 2 start/relight switch	Start (2 secs).
	Ignitor lamps	Check on.
	Master warning lamps	Arm
	LP shaft lamp	On.
	HP cock lever	Start at 1500 to 1850 HP rpm.
	HP cock lever	Open when TGT passes 500°C (or stabilises) or at 5000 HP rpm.
	No.2 engine generator	Reset at 5000 HP rpm.
	No.2 hydraulic EDP	On.
	Engine instruments	Check, warning lamps out.

EITHER CONTINUE WITH THIS DRILL (overleaf) OR WITH CROSSFEED PROCEDURE.

*	Isolation valves	1 open, 2 closed.
*	Air crossfeed valve	Open.
	Port booster pumps	On.
	Frequency/Volt selector	Check readings, select Essential.
	Engine 1 start/relight switch	Start (2 secs).
	Ignitor lamps	Check on.
	LP shaft lamp	On.
	HP cock lever	Start at 1500 to 1850 HP rpm.
	HP cock lever	Open, when TGT passes 500°C (or stabilises) or at 5000 HP rpm.
	No.1 engine generator	Reset at 5000 HP rpm.
	Engine instruments	Check, warning lamps out.
	Start master switch	Off/engines stabilised.
*	Crossfeed valve	Closed.
*	Isolation valves	Both closed.
	Captain to ground	Remove air supply.

When air supply removed:

*	Isolation valves	Open.
*	DV window	Open.

Continue with Start Drill, item 3.

CROSSFEED START

With one engine started by use of the normal drill or by use of the External Air Supply drill, continue with the following drill:

If external supply connected:

*	Crossfeed valve	Closed.
*	Isolation valves	Both closed.
	Captain to ground	Remove air supply.

When air supply removed:

*	Air crossfeed valve	Open.
*	Isolation valves	Both open.
	Running engine	Min rpm to give reqd duct pressure.

IOAT	REQD DUCT PRESSURE
-40°C	40psi
+15°C	39psi
+50°C	33psi

Starts may be attempted at pressures less than that given above, but the TGT must be monitored during the start.

Booster pumps	On (other engine)
Second engine start switch	Start (2 secs).
Ignitor lamps	Check on.
LP shaft lamp	On.
HP cock lever	Start at 1500 to 1850 HP rpm.
HP cock lever	Open, when TGT passes 500°C (or stabilises) or at 5000 HP rpm.

	Engine generator	Reset at 5000 HP rpm.
	Engine instruments	Check, warning lamps out.
	Start master switch	Off/engines stabilised.
*	Air crossfeed valve	Closed.
*	DV window	Open.

Continue with Start Drill, item 3.

Note: Should the APU generator be unserviceable, with APU air available but no external AC, it is permitted to start off the aircraft batteries provided No. 1 engine is started first, and then No. 2 engine started via the crossfeed valve.

GENERATOR/CSD INOPERATIVE (See also Vol. 1 Tech Flight Handling 79)

If necessary, instruct the ground engineer to re-connect the CSD if disconnected from the previous sector.
The air motor must be serviceable.

Generator switch	Trip
CSD Disconnect switch	'Norm'.

Start engine in the normal way.

At 5000HP rpm:

Start master switch	Off, check ignitor lamps out.
CSD Disconnect switch	'Discon'.
Gen fail lamp	Pull to cancel MWS.

IN FLIGHT

FLAME-OUT)
ENGINE SHUTDOWN) See Emergency Drills
ALL ENGINE FAILURE)

LP SHAFT FAILURE SYSTEM OPERATED

Symptoms

1. Engine failure.
2. HP lever locked open.

Action

1.	HP cock lever	Leave open.
2.	Engine fire or shutdown drill	Complete remaining items.

Do not attempt to relight the failed engine.

RELIGHTING See Emergency Drills.

An engine shutdown following mechanical failure, abnormal indication overheat or fire, should not be re-started in flight

TTC CONTROL SYSTEM FAILURE

Symptom - Falling TGT, fuel flow.

Action - 1. TTC/Arm switch - Off.
2. Monitor TGT, maintain within limits by throttle adjustment.

OPERATION WITH UNSERVICEABLE THRUST GAUGE

Action - 1. Use the Engine Check Start Procedure.
2. The runway must be clear of snow, slush and standing water.
3. The standard take-off thrust setting must be used.
4. With 100% achieved on the serviceable gauge, cross check that the following parameters are similar for both engines before brake release:

   (a) HP and LP rpm.

   (b) TGT.

   (c) Fuel flow.

5. After brake release, if there is any major change in HP rpm, TGT, or fuel flow on the engine with the unserviceable thrust gauge up to V_1 - ABANDON TAKE-OFF.

ENGINE VIBRATION

Symptom (a) - Sudden or Progressive increase of 2.0 rel amp under constant power conditions.

Action - 1. Close throttle slowly, monitor TVI.
2. Peak vibration below 5.0 rel amp - continue normal flight, monitor all engine instruments.

Symptom (b) - Sudden or progressive increase to 5.0 rel amp or above.

Action - 1. Trip relevant generator and monitor TVI.
2. If TVI remains above 5.0 rel amp, shut down affected engine if possible.
3. Monitor engine fire and overheat warnings.

When icing conditions are present, intermittent increases above the normal level may be ignored unless other abnormal indications are present or reading fails to return to normal after icing conditions have ceased.

ENGINE HUNTING OR SURGING

Symptoms - Fluctuating fuel flow, TGT, HP rpm, unusual noise or vibration.

Action - 1. Check fuel feed : if deficient, close throttle, then restore proper fuel supply, and set power as required.
2. If fuel feed normal, and fluctuations continue - shut down affected engine.

THRUST REVERSER FAILURE ON GROUND

Symptoms (a) - After selection, Reverser Unlocked warning lamp fails to come on -

Action - 1. If no baulk, use reverse thrust as required.

/Cont'd. ...

Symptoms (b) - 1. Forward Idle selected.
2. Reverser Unlocked Warning lamp remains On.

Action - 1. Check baulk in forward thrust is removed.
2. If not, shut down engine.

THRUST REVERSER FAILURE IN FLIGHT

Symptom - Without selection, Reverser Unlocked warning lamp on.

Action - 1. If normal power in use and engine decelerates, shut down engine.
2. If the warning lamp comes on with the throttle closed, check movement of the normal throttle lever:

If the lever is locked shut - shut down the engine.

EXCESSIVE TGT

Complete actions until TGT is stabilised below limitation or engine shut down.

Action - 1. TTC/Fuel Dip switch - Off.
2. Reduce power.
3. Air Isolation valve - shut.
4. Shut-down engine.

LOW OIL PRESSURE

Symptoms - 1. MWS lamps flashing.
- 2. Engine Oil LP and HP Cock lamps on.

Action - 1. Check associated oil pressure gauge reading:
(a) Below 15 psi - shut-down engine.
(b) Normal - ignore warning, pull oil LP lamp to cancel, ignore steady warnings and monitor gauge reading for remainder of flight.

APU

FAILURE TO START

Symptoms (a) -
1. Start button pressed.
2. No EGT rise.
3. Start indicator remains black.

Action -
1. Repeat APU pre-starting checks.
2. APU CBs - check reset.
3. Repeat starting drill once.

Symptoms (b) -
1. Start indicator changes from black to Start, possibly to black again.
2. No EGT rise, or EGT rise and subsequent fall.
3. Oil LP warning lamp remains ON, or goes out and comes on again.

Action -
1. APU Control switch - Off.
2. Start Master switch - Off.
3. Summon Engineering assistance.

Do not attempt a further start until the APU has been checked for fuel drainage and the area beneath the tail is checked clear of spilled fuel.

LOW OIL PRESSURE

Symptoms (a) -
1. Start Indicator - Run.
2. Oil LP warn lamp - On.

Action -
1. APU Control switch - Off.
2. Air Delivery valve - Close.

EXCESSIVE EGT

Symptom (a) - EGT exceeds 760°C (710°C Mk5).

Action - 1. Shut down APU.
2. Enter details in Tech Log (APU must be changed).

Symptom (b) - EGT exceeds 710°C (570°C Mk5) at governed speed.

Action - 1. Air Delivery valve - Shut.
2. Shut down APU if EGT remains above 710°C (570°C Mk5).
3. Enter details in Tech Log.

LEADING PARTICULARS AND LIMITATIONS

HYDRAULIC POWER

Fluid Specification - BE HYD 1
Any mixture of - Skydrol 500B
Reclaimed BE HYD 1

System working pressure - 3,000 psi.

DC pump - rated for 5 min continuous operation.
20 min cooling period.

Aux pumps - rated for continuous running.

Low Press Warning - Engine pumps - pump delivery pressure, or reservoir air pressure falling.
Aux pumps - pump delivery pressure falling.

Hydraulic systems are normally topped-up so that contents are indicated at the top end of the green sector. Any fall in quantity below the top of the green sector should be closely monitored and subsequently advised in the Technical Log, as this may be an indication of a leak developing.

MWS FUNCTIONS

Amber - Hydraulic and/or air pressure failure.
Aux pump motor overheat.
Hydraulic fluid overheat.

UNDERCARRIAGE

Max Speeds

U/C locked down, doors shut - V_{MO}
During raising or lowering - 220 kt.
Free fall lowering and subsequent flight. - 220 kt.

Brake Pressures

Max foot brake application - 3,000 psi.
Max hand brake application - 3,000 psi.
Auto-braking - 1,000 - 1,800 psi (pre mod 32A487).
400 - 600 psi (post mod 32A487).
Emergency braking - Sufficient pressure for one full braked landing (footbrakes) and six hand brake applications.

Nosewheel Steering

Tiller steering range - to 78° either side of centre.
Rudder fine steering - to 7° either side of centre.
Towing range - to 110° either side of centre, (torsion links disconnected).
Standby steering press - 3,000 psi. Sufficient for directional control during landing and for clearing runway.
Steering LP warning - 2,000 psi.

Max Brake Temperatures

Before Take-off - See table in Check Lists & Drills.
For U/C retraction - 400°C

Tyre Pressures

Main - 155 psi.
Nose - 116 psi.

BRAKES/TYRES INSPECTIONS

A full brake inspection is required following an abandoned take-off, when take-off is abandoned above 100 kt.

MWS FUNCTION

Amber - Stand-By Steering pressure failure.
2000 psi.

BRAKES/TYRES INSPECTIONS

A full brake inspection is required following an abandoned take-off, when take-off is abandoned above 100 kt.

MWS FUNCTION

Amber	Stand-By Steering pressure failure.

ABNORMAL MANAGEMENT

HYDRAULIC POWER

SYSTEM FAILURE

Pressure Fail Warning Lamp On

Action - 1. Pressure - Check. If less than 1,500 psi:
2. System reservoir contents - check.
3. Failed pump - Off.
Alternate pump - On. Check pressure.
4. If alternate pump unavailable - Off.
System inoperative.
5. Aux. pump, opposite system - On.

Low/Falling Reservoir Contents

Action - 1. System Hydraulic Cut-off lever - Off.
2. Aux. pump, opposite system - On.
If contents continue to fall:
3. Both pumps, affected system - Off.
System inoperative.

If it is essential to operate a service by the failed system, the EDP may be switched on briefly, provided fluid contents in green or yellow sector; if the contents are in the red sector:-

No. 1 system - Use Aux. pump only.
No. 2 system - Emergency Elevator operation.
DC pump for limited services.

Aux. Pump Overheat Warn Lamp On

Action - 1. Aux. pump - Off, Overheat lamp Out. Use pump only in emergency; if pump is switched on, the overheat lamp may come on immediately if the thermostat has not reset.

Fluid Overheat Lamp On

Action - 1. Both pumps affected system - Off.
Aux. pump opposite system - On.
2. System pressure - Check falling.
If EDP fails to off-load - See drill below.
If lamp goes out:
3. Aux. pump affected system - On.
Monitor Overheat lamps.

If the Overheat lamp remains on, or comes on again both pumps should be switched Off for the remainder of the flight; if essential to reinstate the system, use the EDP for brief periods.

EDP Fails To Off-load

Symptoms - 1. System pressure exceeds 3300 psi consistently, with or without Fluid Overheat warning.

Action - 1. Both pumps affected system - Off.
Both pumps opposite system - On.
2. Monitor affected system pressure.
If pressure does not fall:
3. Airframe anticing, affected system - Off.
Master Valve, affected system - APU.
Air cross-feed valve - Close.
4. Fire control handle, affected engine - Pull.

> Hydraulic system pressure should fall immediately - if not, complete Engine Shut-down Drill.

5. If there is no fall in system contents and no overheat warning exists - Use Aux pump for essential services.

NOTE: If No. 2 Aux pump On-Conditioning Fan inoperative. See Air Conditioning.

/Cont'd. ...

6. Re-instate affected air system:
    - (a) Hyd. shut-off valve CB - Trip (System 1 - CB 194, System 2 - CB 197)
    - (b) Fire control handle - Fully in.
    - (c) Master valve, airframe anticing - As required.

Effects of Failure on Systems Management:

Engine pump inoperative	-	All services available on Aux pump pressure.
Aux pump inoperative	-	No back-up for services supplied by No. 1 System engine pump pressure. No. 2 System - no back-up for flying control systems supplied by No. 2 System pressure; emergency elevator inoperative.
DC pump inoperative	-	Emergency Flap system inoperative, no ground facilities available.
Engine and Aux pump inoperative	-	No. 1 system - total failure No. 2 system - Intermittent operation of some services by DC pump only.

Total Failure No. 1 System

Action - 1. Lift dumpers, outboard spoilers, stbd W/S wiper inoperative.

2. U/C cannot be retracted, free-fall lowering.

3. Steering - Select Stand-by Steering On, when U/C is locked down.

4. Flying Controls - Powered by No. 2 System only.

/Cont'd. ...

No. 2 Engine and Aux Pump Failed

Action - 1. Inboard spoilers, Emergency elevator inoperative.
2. Ventral stairs, port W/S wiper, brake acc charging by DC pump pressure.
3. Normal flap system operative provided No. 1 System serviceable.
4. Emerg flap lowering operative provided DC pump serviceable.
5. Brakes - stored acc pressure only, normally sufficient for one complete foot-braked landing with anti-skid operating and a minimum of 6 hand brake applications.
6. Flying Controls - Powered by No. 1 System only.

For landing, and flight with Emergency Elevator system engaged or full manual reversion - see 'Abnormal Handling'.

If the U/C is still extended at the completion of any of these drills, an immediate return should be initiated if possible; if a diversion is necessary - see Flight with U/C Extended, Abnormal Handling chapter.

FAILS TO RETRACT

Immediate Action - 1. Select/Maintain full power to safe height.
2. If selector lever is locked and obstacle clearance critical - use override lever by simultaneously pressing down on the lock override lever and selecting U/C Up.

NOTE - The safety lock may not disengage after take off because one main oleo leg remains compressed; retracting the U/C with override pressure could damage the wheel bay fairings.

3. Complete appropriate drill below:

Selector Lever Locked in Down Position.

Action - 4. CB115 - check Reset.
5. Attempt Up selection.

Selected Up. Fails to Retract.

Action - 4. No. 1 Hydraulic system pressure - check. If system inoperative U/C cannot be retracted.

Green Lamps Out. Red Lamp On.

Action - 4. U/C Lever - check fully in Up position: release knob fully in to engage latch.
5. Speed - below 220 kt.
6. Re-cycle Down/Up once.
7. Red lamp remains on - max speed for remainder of flight 220 kt.
8. Red lamp remains on when U/C selected Down for landing - Complete U/C Lowering Malfunctions drill.

/Cont'd. ...

Selected Up. Nosewheels Remain Locked Down.

Action - 4. Airspeed - below 220 kt IAS.
5. Select U/C - Down.
6. Steer nosewheels to centre, select U/C - Up. Nosewheels remain down:-
7. U/C Selector lever - Down.
8. Select Free Fall before landing to depressurise system and allow wheels to castor.
9. Do not select standby steering - maintain directional control with rudder and differential braking.

No U/C Indicator Lamps On

Action - 4. CB B203, panel B - Trip and Reset.
5. Check lamps.

If lamps remain Out or CB trips again:

6. Select U/C Up.
7. Check mechanical indicators, use wheel well light for nosewheel check.

AUTO-BRAKE REMAINS ON

Symptoms - 1. U/C selected Up, locked up.
2. Handbrake pressure gauge indicates 400 to 600 psi brake application.

Action - 1. Handbrake lever - fully up and release. Check press. Zero.

If pressure does not release:

2. Continue normal flight. If brake temp in excess of 400° carry out Excessive Brake Temp Drill.
3. Pressure should dissipate when undercarriage selected down.

If auto-brake pressure not released:

4. Exercise hand-brake lever.
5. Consider suitability of destination and alternate airfields for landing with brakes on.
6. Inform ATC, brief CC i/c, risk of brake fire/burst tyres.
7. After landing - complete the 'U/C, Tyre or Brakes Defect on Ground' drill.

EXCESSIVE BRAKE TEMP AFTER TAKE-OFF (above 400°C)

Action - 1. Leave U/C Down - unless obstacle clearance critical.
2. If already retracted - Lower U/C, obstacle clearance permitting.
3. When brake temp below 400°C - select U/C Up.
4. On landing - tyre on affected wheel could deflate.
5. After landing - Compete the 'U/C, Tyre or Brakes Defect on Ground' drill.

U/C DAMAGE DURING TAKE-OFF, TYRE FAILURE SUSPECTED

Action - 1. U/C - leave Down unless obstacle clearance critical. If already selected Up, reselect Down when retraction competed, obstacle clearance permitting.
2. Leave U/C extended for at least 5 minutes, do not apply brakes. Check Hydraulic press/contents.
3. Check brake temperatures normal, retract U/C.

At the Captain's discretion, any part of this procedure may be omitted or delayed because of overriding flight safety considerations. If ATC report a tyre failure during take-off, a fly past at low altitude is not recommended provided the U/C is fully locked down and the steering handwheels are centralised.

4. After landing - Complete the 'U/C Tyre or Brakes Defect on Ground' drill.

RESIDUAL BRAKE PRESSURE AFTER AUTO-BRAKE RELEASE

Symptoms - 1. U/C retracted, indicated brake pressure falls.
2. Steady brake pressure of 100-200 psi remains.

/Cont'd. ...

Action - 1. When U/C lowered - apply foot brake pressure and release.

If pressure not fully dissipated:

2. Alert ATC, risk of burst tyres/brake fire.
3. Brief CC i/c.
4. After landing - Complete the 'U/C, Tyre or Brakes Defect on Ground' drill.

U/C FAILS TO LOWER

> If the mechanical indicators show each U/C correctly locked down, the failure of any green lamp can be ignored. If the red Unsafe lamp remains on at the completion of any drill below, one or both main U/C doors may be open, a microswitch failed, or a downlock malfunctioned.

When checking the Nosewheel Mechanical Indicator, the wheel well lighting should be ON, and a full green disc should be visible.

No Lamps On during or after Selection:

Action - 1. CB 203, panel B - Trip and Reset.

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If lamps remain out:

2. Check U/C mechanical indicators.
3. 'Free Fall U/C Lowering' drill if necessary.

Red Lamp On - No GREEN lamps On:

Action - 1. Check System 1 pressure available.

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2. Select Up, repeat Down selection.
3. Green lamps remain out - 'Free Fall U/C Lowering' drill.

Red Lamp On - LESS THAN THREE GREEN lamps On:

Action - 1. At Captain's discretion - Select Up, repeat Down selection.

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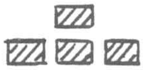
2. Any green lamp still out - Check mechanical indicator.
3. Leg still not locked down, or red lamp remains On - 'Free Fall U/C Lowering' drill.

/Cont'd. ...

Red and Three Green lamps On:



Action - 1. GEAR Selector lever - Check gated Down and knob pushed fully In.
2. At Captain's discretion - Select Up, repeat Down selection.
3. Red lamp still On - 'Free Fall GEAR Lowering' drill.

Selector Lever Jammed Up or at Intermediate Position:

Action - 1. 'Free Fall GEAR Lowering' drill.

NOTE - If lever is not in the locked down position - select antiskid braking off.

2. Ground locks must be fitted when aircraft stopped, Engineer's check before taxying.

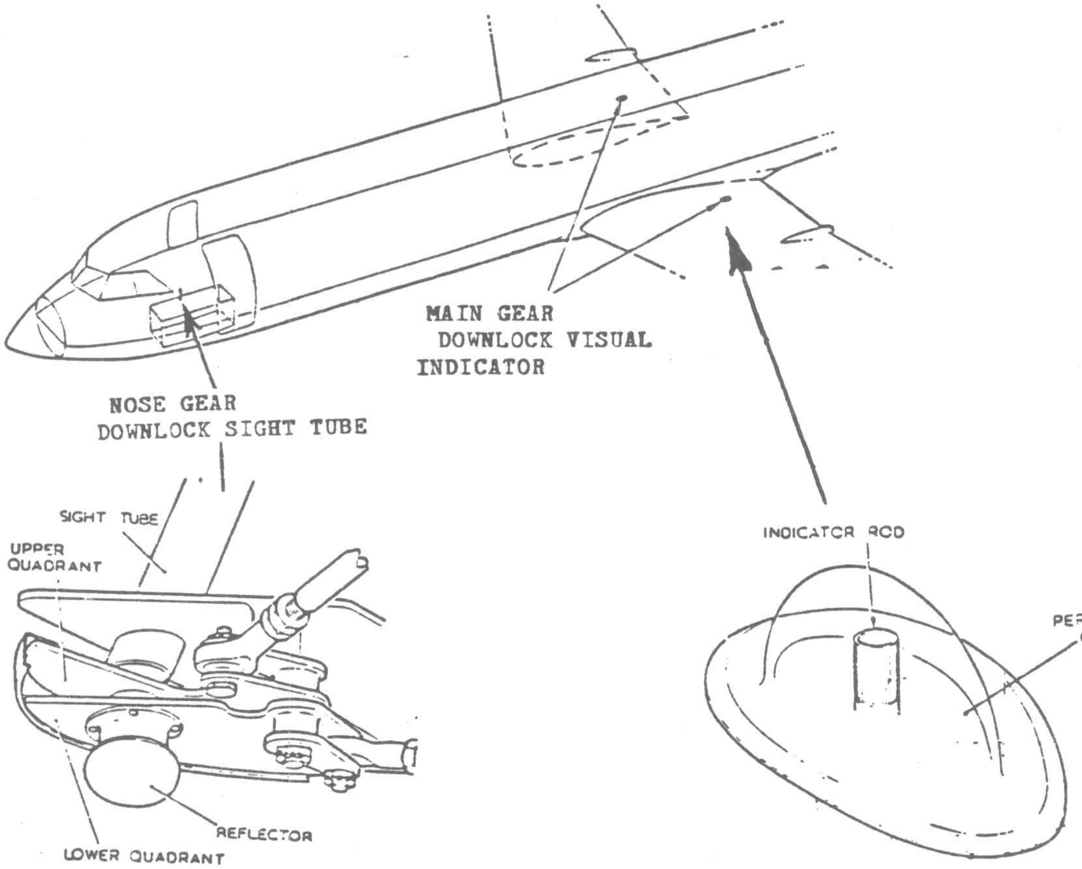
FREE FALL GEAR LOWERING

1. Max speed - 220 kt.
2. GEAR Selector lever - Down, if possible.

NOTE - If lever is not in the locked down position -
a. Select antiskid braking off.
b. Trip GPWS, CB483 Panel RB.

3. Free Fall lever - Raise cover, squeeze handles completely together and pull lever fully up, release locking handle and check levers locked.
4. Check GEAR locked down (electrical/ mechanical indicators. Red lamp remains on). See Figure 1 for visual mechanical indicators)
5. Stand-by Steering switch - On when GEAR locked down.
6. The Free Fall lever must not be moved until GEAR ground locks have been fitted.

Both main doors remain open, held off the ground by spring struts; they will touch the runway surface momentarily during touchdown.



NOSE GEAR MECHANICAL INDICATOR

Confirmation of the Nose gear down and locked, can be checked by looking down the sight tube and observing a complete reflected green disc of light. This occurs when the two quadrants are exactly superimposed. The wheel well light must be switched ON.

MAIN GEAR MECHANICAL INDICATOR

When green painted rod extends into perspex cover, the associated main gear leg is locked down.

FIGURE NO. 1

STEERING RUNAWAY AFTER GEAR LOWERING

Symptoms -
1. GEAR selected Down, three green lamps on.
2. Tillers move to fully off-set position.

BRAKE ACCUMULATOR PRESSURE LESS THAN 3,000 PSI

Action - 1. Check No. 2 System hydraulic pressure.
2. Monitor brake pressures during brake applications.
3. System 2 contents in red sector - Use DC pump intermittently to top-up brake accs.

LANDING WITH NO. 2 SYSTEM PRESSURE FAILURE

Action - 1. After touchdown - use footbrakes until stored acc pressure exhausted (normally one full anti-skid landing), the handbrakes (min 6 applications using stored acc pressure only).

LEADING PARTICULARS AND LIMITATIONS

FLAPS

Max speeds for flaps lowering:

Up to 18° - 239 kt.
18° to 26° - 190 kt.
26° to 45° - 180 kt.

Max speeds with flaps at 8° or 18°:

After take-off and during intermediate approach - 239 kt.
During descent (or holding) - 220 kt.

If the maximum speed for a flap setting is exceeded, the aircraft must be slowed to or below that speed before the flaps are raised.

Emergency Flap selection (18°)

Max speed during selection - 180 kt.
Time taken to reach 18° - 4 min approx.

The flaps must not be lowered above FL150.

SPEED BRAKES/SPOILERS

Above FL150 - Max 20° extension.

Lift Dumpers, inboard or outer speedbrake sections inoperative - see 'Abnormal Handling' section.

Max Speed with Inner and/or Outer Spoilers unserviceable - 270kt/0.72 M_{IND}.

Speed brakes must not be extended in flight when the flaps are lowered, and should not be extended for long periods in severe turbulence, e.g. during descent.

AUDIBLE WARNINGS

Continuous - Stall Rec and stick push. (Klaxon)
With U/C not fully locked down (Horn):

1. Flaps selected 26° or 45°, or:
2. Either throttle closed to below approach power setting and airspeed below 165 kt.

Intermittent - Take-off configuration (Horn)

MACH TRIM

Engaged above - 9.700 ft and M_{IND} 0.68, provided auto-pilot not engaged.

STALL PROTECTION

Min HP reservoir pressure for take off - 500 psi.

LP Warn lamp - On when pressure falls below 45 psi.

Stick shake/Stick push speeds - See Handling Limitations

MWS FUNCTIONS

Red	-	Elevator Emerg Fail lamp Servo Fail Warn lamps
Amber	-	Spoiler Fail warn lamps Elevator Emerg LP warn lamp Flap Shaft Fail warn lamp Feel System Failed

HYDRAULIC POWER FAILURE - See Hydraulic Services chapter.

FULL MANUAL REVERSION - See Abnormal Handling chapter.

SPOILER FAIL LAMP ON

Action - 1. Spoiler switch - Off.
2. Speed limit for remainder of flight 270 kt/0.72M.
3. Now see 'Landing - Spoilers and Lift Dumpers inoperative', Abnormal Handling chapter.

NO.1 SERVO FAIL WARN LAMP ON

Action - 1. Hydraulic Cut-off lever - Off.
2. No.2 Aux pump - On.
3. Services lost:
Outer speedbrake sections.
4. Remaining Flying Controls powered by No.2 system. Flaps, TPI, operate at reduced rate.
5. Max Speed 270 kt/0.72 M_{IND}.
6. Maximum Crosswind Component 20 kt.

NO.2 SERVO FAIL WARN LAMP ON

Action - 1. Hydraulic Cut-off lever - Off.
2. No. 1 Aux pump - On.
3. Services lost:
Inner speedbrake sections.
4. Remaining Flying Controls powered by No.1 system
5. If the seized valve is on either elevator jack section powered by No.2 system, Emergency Elevator system will be inoperative.
6. Max Speed 270 kt/0.72 M_{IND}.
7. Maximum Crosswind Component 20 kt.

EMERGENCY ELEVATOR SELECTOR

Action - 1. Nos. 1 and 2 Hydraulic Cut-off levers - Off.
2. Elevator Emerg switch - Emerg. Check green lamp on.
3. LP and Fail lamps - Out.
4. Feel - constant at equivalent for 180 kt IAS.

See 'Abnormal Handling' section for procedures.

EMERGENCY ELEVATOR SYSTEM FAILURE

Symptoms - 1. Either or both system lamps On.

Action - 1. Elevator Emerg switch - Off. Green lamp - Out
2. Complete flight with full manual reversion - see 'Abnormal Handling' section.

EMERGENCY FLAP LOWERING

Action - 1. Airspeed - at or below 180 kt IAS.
2. Flaps Selector lever - 18°.
3. DC pump switch - Emerg Flap, to Off when 18° flap position indicated.
4. See Flapless or Partial Flap Approach and Landing, Abnormal Handling chapter.

Once the 18° position has been achieved, the emergency system should not be used for further lowering or flaps retraction (motor limitation). The flaps take 4 min approx to reach 18°. Brakes 'topping-up' should not be attempted before selecting the Emerg Flap system.

FLAPS FAIL TO FOLLOW SELECTION

Action - 1. Return Flap Selector lever to gated position nearest to achieved flap setting.
2. Observe max speed for flight with flaps extended to next gated position beyond achieved flap setting, e.g.:-
   Achieved setting 20° - use 26° for selecting maximum speed.
3. Now see Flapless or Partial Flap Approach and Landing, Abnormal Handling chapter.

FLAP POSITION INDICATOR FAILURE

Action - 1. Prior to take-off and landing, check the flap position visually by observing the incidence markings aligned with the wing trailing edge. View markings through cabin windows at seat row 14.

FLAP SELECTOR FAILURE IN FLIGHT

Flap Selector Lever Jammed

Action - 1. Observe the flap limiting speed for the achieved or intended flap setting.
2. Apply up to 4 times the normal force to the selector lever.

If the selector lever moves (seized control valve):

3. Identify failed valve - servo fail lamp comes On.
4. Appropriate hydraulic cut-off lever - Off.
5. Check warning lamp out and flaps running to selected position.
6. Subsequent selections will require the same overriding force, but the servo fail lamp will remain out, and the isolated section of the flap motor will 'free wheel'.

If the selector lever cannot be moved:

3. No further flap selections can be achieved.
4. Flaps extended - observe the appropriate speed limitation for the achieved setting.
5. Now see Flapless or Partial Flap Approach and Landing, Abnormal Handling chapter.

With No. 2 system flap control valve inoperative, the Emergency Flap system is also inoperative.

FLAP SHAFT FAIL LAMP ON IN FLIGHT (steady of flashing)

Action - 1. Flaps extended beyond 8° - immediately select 8° flap, check airspeed.
2. Flaps may be selected from 8° to 0° for climb and cruise.
3. Complete the approach and landing with maximum 8° flap; this flap setting must not be exceeded for the remainder of the flight.
4. See Flapless or Partial Flap Approach and Landing, Abnormal Handling chapter.

FLAP OVERSPEED LAMP ON IN FLIGHT.

Action - 1. Speed above 220 kts - Check Flap Selector position If speed above 239 kts and Flaps not selected UP, reduce below 239 kts and select Flaps Up.
2. Speed below 220 kts - No further action.

IN-FLIGHT FEEL FAIL WARNING

Symptom - 1. Warning lamp On for 10 sec minimum.

Action - 1. Hydraulic systems - Check.
2. 'Q' heater ammeters - Check.
Heaters failed - feel warning may clear during descent.
One hydraulic system failed - lamp should remain On, but little change in control forces.
3. Before commencing final approach - disengage autopilot, and check feel forces by gentle rudder and elevator movement.

Disregard transient warning during taxying or in turbulence. At or below 170 kt, forceful or large rudder movements may produce transient warnings which may be ignored. A steady warning is an indication of a genuine failure.

Feel Fail Warning on the Ground

Symptoms - 1. Warn lamp On (Steady) after engines started.
2. No other failure.

Action - 1. Both engines- Increase power to 10,000 HP rpm for 30 sec.
2. Check whether warning clears.

COMPLETE LOSS OF FEEL SIMULATION

Symptom - Complete loss of elevator and/or rudder feel.

Action - 1. Avoid large inputs to flying controls.
2. Do not select Emergency Elevator.
3. With autopilot engaged, the autopilot trim indicators must be monitored, and the aircraft re-trimmed as necessary.
4. Consider landing at the nearest suitable airfield.

MACH TRIM RUNAWAY

Action - 1. Hold trimwheel stationary, light force required.
2. Mach trim switch - Off.
3. Re-trim aircraft.
4. With Mach Trim inoperative and autopilot disengaged - max speed M_{IND} 0.72.

TAILPLANE TRIM FAILURE

Action - 1. Mach Trim isolate switch - Off.

If trim wheel still fails to rotate:

2. Apply increased force to either trim wheel.

If either servo motor has failed, a force of approx. three times normal will break out the clutch and allow trim wheel movement; if the clutch has also failed, the trim wheel cannot be freed.

3. If, with approx. five times normal force, the trim wheel moves and one servo fail warn lamp comes on, select the system hydraulic cut-off lever to Off (tailplane actuator failed); the system will operate on the remaining actuator, at a reduced rate.

STALL PROTECTION SYSTEM MALFUNCTIONS

With the aircraft attitude and IAS normal:-

Symptom (a) - Stick shaker/auto-ignition operates.

Action - 1. Trip No. 1 or 2 Stall Prot. system CB panel P, as appropriate.

With the aircraft attitude and IAS normal:-

Symptoms (b) - 1. Stick push without prior stick shake,
or:-
2. System fail lamps and Valve open lamp(s) on.

Action - 1. Stick push dump lever - turn and pull out.

Q FEEL PITOT HEATER FAILURE

Action - 1. Check appropriate CB (port B49, stbd B57) panel B.
2. If heater failed:
(a) Monitor ammeter of operative heater.
If that heater also fails:
(b) Regard entire feel system as inoperative.
(c) See Complete Loss of Feel Simulation, this chapter.

FLIGHT WITH ONE Q FEEL PITOT HEATER UNSERVICEABLE

Action - 1. Passengers and goods may be carried for hire. and reward to nearest station where rectification can be accomplished.
2. Icing must not be forecast en-route.
3. Precipitation must not be forecast en-route, if flight is required in temperatures below +10 °C.
4. Q Feel pitot system water drains to be cleared by engineer before departure.
5. Hot rod or rotary ice detector to be serviceable.
6. During flight the operative Q Feel pitot heater ammeter must be monitored; should the ammeter fail:-
(a) The entire feel system should be regarded as failed.
(b) Follow the procedures for complete loss of feel simulation, this chapter.

STALL RECOGNITION SENSOR HEATER FAILURE

Symptom - Heater Fail warning lamp on.

Action - 1. Check heater CB.

B76	No 1	Stall Warning Heater
B84	No 2	Stall Warning Heater
B67	No 1	Stall Recovery Heater
B75	No 2	Stall Recovery Heater

2. Heater Fail lamp remains on -
Trip CB of affected Stall Warning and Recovery system if in icing conditions.

P370 Stall Warning and Recovery No 1.
P351 Stall Warning and Recovery No 2.

LEADING PARTICULARS AND LIMITATIONS

AIR CONDITIONING

Cabin and flight deck temperature control range - 65° - 85°F.

Maximum differential pressure (discharge valve) - 7.5 psi.

Absolute maximum differential pressure (safety valve) - 8.0 psi.

Safety valve reserve control - 7.0 psi.

Discharge valve emergency pressure control setting - 9000 ft. approx

Cabin Altitude warning - 10,000 ft.

Mains temperature - normal range - 180° - 230°C. May be exceeded under conditions of extreme OAT and/or power.

A single pneumatic supply (excluding APU) is capable of providing either:-

> One Air Conditioning system and one Airframe Antice system (one master valve and one airframe wing and tail antice valve open with the Crossfeed valve open if either are NOT on the same side as the available air supply).

Minimum duct pressure required to maintain adequate cabin ventilation with or without airframe anticing.
- 2 Engines - 20 psi
- 1 Engine - 38 psi

Fan Intake switch must be set to 'Shut' if taking off or landing in snow, slush, or deep standing water.

Maximum Altitude with one engine air supply:

APU serviceable - 25,000 ft.
APU unserviceable - 22,000 ft.

MWS FUNCTIONS

Red - Cabin altitude 10,000 ft or over.
Amber - System failure.
Master valve closed.

Air Conditioning must not be used while External Ground De-icing is in progress.

OXYGEN

Normal supply pressure - 40 psi.
duration from 'Reserve', all crew and passenger masks in use - 35 min. approx

'Drop-out' supply pressure - 100 psi.
duration from 'Reserve', all crew and passenger masks in use - 17 min. approx.

'Drop-out' cabin altitude - 12,000 ft ± 750
14,400 ft ± 500
post-mod 35A001.

Intermittent hooter - 11,250 ft
14,400 ft ± 500 ft
post-mod 35A001.

Duration of 120 litre cylinder from full - 35 minutes for 1 crew mask.

Duration of 310 litre smoke mask cylinder from full - 10 minutes approx.

AIR CONDITIONING

RAPID DEPRESSURISATION

See Pilots' Check Lists and Drills.

SLOW DEPRESSURISATION

Symptoms -
1. Cabin pressure DEcreasing.
2. Cabin altitude INcreasing.
3. Red alert lamps flashing. Cabin Altitude warning lamp on (10,000 ft cabin altitude).
4. Oxygen hooter sounds (11,250 or 14,400 ft cabin altitude).

Action -
1. Oxygen hooter - Cancel.
2. Mains pressures - Check adequate.
3. Discharge valve indicator - Check Shut, if not - select lower altitude on pressure controller.

If cabin altitude fails to decrease:

4. Air dump valve - press and open slowly until Cabin VSI shows increased climb indication, then:
5. CB B53 (panel B, coded Green) - Trip.
6. Air dump valve - Close slowly to achieve Descent indication, then as required to achieve and maintain desired cabin altitude.

NOTE: The Air Dump Valve control is extremely sensitive, requiring only small movement to achieve the desired result.

OVER-PRESSURISATION

Symptoms -
1. Cabin pressure INcreasing.
2. Cabin altitude DEcreasing.

Action -
1. Select a higher altitude on pressure controller.

If pressure does not decrease,

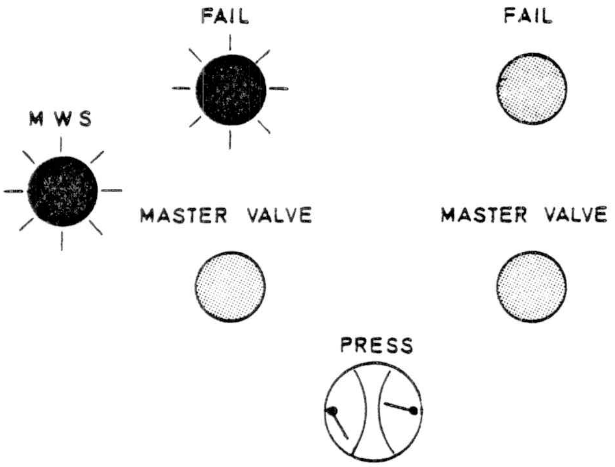
2. Air dump valve - Press and open slowly until cabin VSI shows Climb indication; when required cabin altitude regained:-
3. CB B53 (panel B, coded Green) - Trip.
4. Air dump valve - as requiring to maintain desired cabin altitude.
5. If necessary, reduce air supply by closing one master valve.

NOTE: The Air Dump Valve control is extremely sensitive, requiring only small movement to achieve the desired result.

AIR SUPPLY AND CONDITIONING SYSTEM FAILURES

Single System Failure

Reduced air flow



1. Fail warning lamp - Pull.
2. Reset button - Press.

3. If Fail warning lamp goes out and stays out - Reset.

If Fail warning lamp goes out, then relights:

4. Isolation Valve switch - Closed.
5. Reset button - Press.
6. Check Fail lamp out.

If airframe anticing OFF:

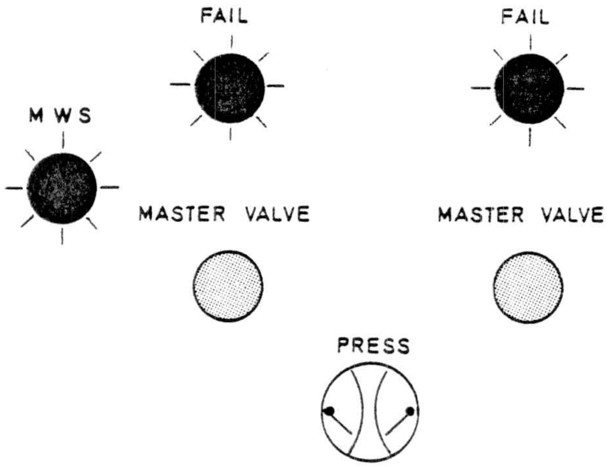
7. Air crossfeed valve - Open.

If Fail warning lamp re-lights or
if airframe anticing ON:

7. Air crossfeed valve - Closed.
8. Maintain at least 38 psi Mains pressure in live system.
9. Refer - Flight With One Air Supply System Unserviceable, page 10.

FAILURE - One air supply system override -
Over-temperature.
Over-pressure.
Stub fairing bay overheat:

Double System Failure

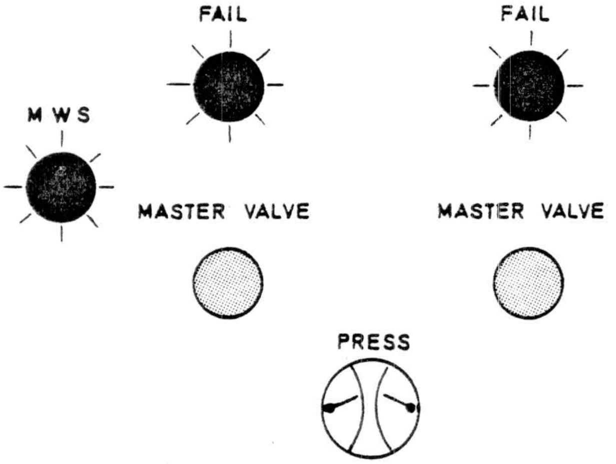


No air flow.

1. Fail warning lamps - Pull.
2. Both Isolation Valve switches - Closed, or:
   Air Delivery valve - Close (Conditioning from APU).

3. Descend. Follow Unpressurised Flight procedure.
   (Airframe anticing not available).

FAILURE - Both air supply systems overrides.



Normal air flow.

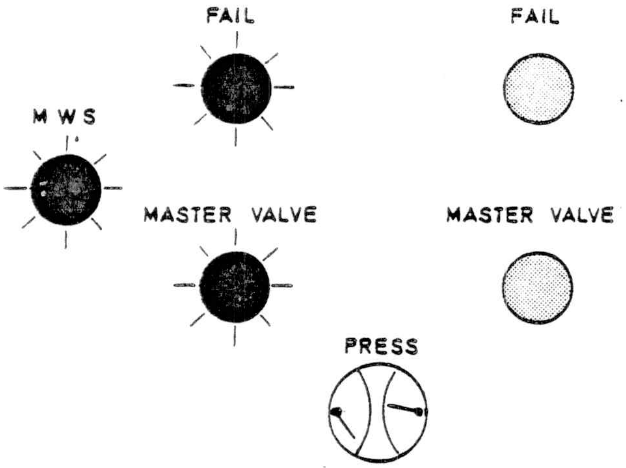
1. Fail warning lamps - Pull.
2. Isolation valves - Close in turn, allowing 2-3 min. for cooling.
   Whichever valve causes lamps to go out must be left closed.

3. Live system Fail warning lamp - Reset.
4. Maintain at least 38 psi Mains pressure in live system.

FAILURE - Leakage from one fuselage duct, upstream from master valve.

Air Conditioning Overheat

Reduced air flow.



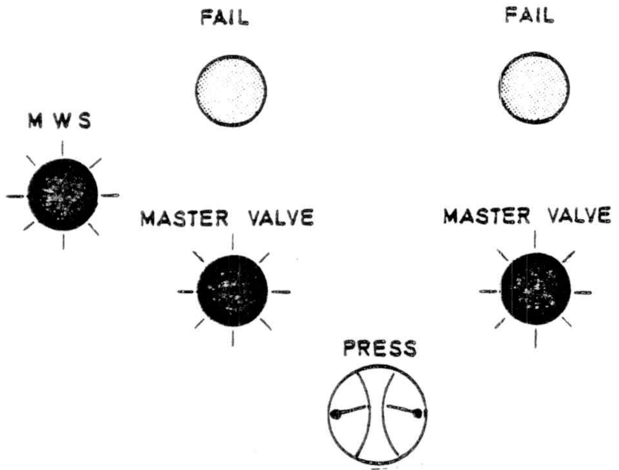
1. Both warning lamps - Pull.
2. Master Valve switch - 'Close'.
3. Check both warning lamps out.
4. Master Valve switch - 'APU' or 'Open'.

5. If lamps remain out - Reset.
   If lamps re-light, Master Valve switch - 'Close'.
6. Check both warning lamps out.
7. Maintain at least 38 psi Mains pressure in live system.

FAILURE - Duct overheat down-stream of master valve.
Cold air unit overheat.

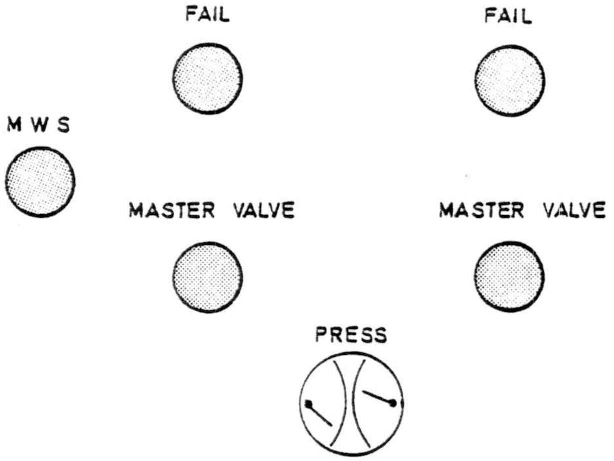
Cooling Fan Isolated

No air flow on ground.



1. Master Valves & Conditioning Fan switch - 'Normal'.

FAILURE - Switch at 'Isolate'.



Electrical Control Failure

Reduced Airflow

1. Air Supply CBs - Check. Reset if tripped (one attempt).
2. System pressure restored - monitor system indications.

System still inoperative:-
(a) Isolation valve - Close.
(b) Crossfeed valve - Open if airframe anticing Off. Close if airframe anticing On (maintain 38 psi. min. in live system).

3. Refer - Flight With Air Supply System Unserviceable, page 10.

Electrical Failure within Air Conditioning System

DOOR WARNING LAMP ON OR SUSPECT DOOR

Symptom (a) - Inability to pressurise.

Action - 1. Check flight deck door warning lamps.
If all out:
2. Test button - Press.
If Front Passenger or Service lamp fails to light:
3. Action as for symptom (b).
If either Cargo lamp fails to light:
4. Change the bulb.
If lamp then lights or if there is still no response to test button:
5. Action as for symptom (e).

Symptom (b) - Front Passenger or Service lamp on.

Action - 1. DO NOT TOUCH DOOR HANDLE.
2. Check 'Hook' and 'Butt' lamps on door.
If either or both lamps on:
3. Check mechanical indicator - if it completely fills window, door is safe.
If both lamps out or if indicator does not completely fill window:
4. Pressurise to 1 psi or maintain differential if greater.
5. Move people away from door area, if possible.
6. Fasten Seat Belts switch - On.
7. Flight may be continued as planned, depressurising as late as possible on final approach.
If unable to pressurise handle the aircraft gently, do not use speedbrakes, and land as soon as possible.

Symptom (c) - Rear Passenger lamp on.

Action - 1. Ensure that door handle is in closed position.
2. Continue flight as planned, depressurising as late as possible on final approach.
If unable to pressurise instruct a cabin crew member to prevent passengers from opening the door:
3. Fasten Seat Belt switch - On.

Symptom (d) - Ventral lamp on.

Action -
1. Fasten Seat Belts notices - On.
2. Inspect ventral door through rear passenger door.

If the ventral door appears closed:

3. Handle aircraft gently, and avoid use of speedbrakes. If turbulence or adverse weather not expected, arrange monitoring of door position for rest of flight, continue to destination.

If the ventral door appears unlatched and/or trailing:

3. Handle aircraft gently, and avoid use of speedbrakes. Land as soon as practicable.

Symptom (e) - Front Cargo, Rear Cargo, Electric Bay or Radio Bay lamp on.

Action -
1. Maintain, or pressurise to, not less than 1 psi.
2. Continue flight as planned, depressurising as late as possible on final approach.

If unable to pressurise:
3. Fasten Seat Belt switch - On.
4. Handle the aircraft gently, do not use speedbrakes, and land as soon as possible.

Symptom (f) - Front passenger or service door, either 'Hook' or 'Butt' lamp out (modified aircraft).

Action - If appropriate flight deck door warning lamp on:
1. Action as for symptom (b).

If appropriate warning lamp out:
1. Test button - Press.

If lamp then lights:
2. Continue flight as planned. Security of door may be verified by checking mechanical indicator.

If lamp does not light:
2. Action as for symptom (b).

/Cont'd. ...

Symptom (g) - Front passenger or service door, both 'Hook' and 'Butt' lamps out (modified aircraft).

Action - If appropriate flight deck door warning lamp on:
1. Action as for symptom (b).

If appropriate door warning lamp out:
1. Test button - Press.
If lamp then lights:
2. Check mechanical indicator - if it completely fills window door is safe.
If lamp does not light:
2. Action as for symptom (b).

UNPRESSURISED FLIGHT

Action (a) - If due to structural defect (e.g. cracked window):
1. Air conditioning - Operate as normal.
2. Air Dump Valve control - Fully 'Open'.
3. Fasten Seat Belt switch - On.

Action (b) - If due to air supply or air conditioning system defect:
1. Air Dump Valve control - Fully 'Open'.
2. Ram Air Valve switch - 'Open'.
(Air conditioning will not be available).
3. Fasten Seat Belt switch - On.

MANUAL PRESSURE CONTROL

Before Departure

1. Cabin Press Ctl Amp CB B53 (panel B) - Trip.
2. Air Dump Valve control - Fully 'Open'.

After 500 ft

1. Air dump valve - Shut slowly to control pressurisation in conjunction with cabin rate-of-climb indicator and pressure gauge.

Descent

1. Air dump valve - Open slowly, monitoring cabin rate-of-climb indicator and pressure gauge (valve to be fully open at airfield height +500ft).

NOTE: Should manual pressure control be necessary in flight, always take up slack in dump valve cable (i.e. establish a cabin rate of climb) before tripping circuit breaker.

PLANNED FLIGHT WITH COOLING FAN UNSERVICEABLE

Cabin air supplies must only be used in the air after take-off, and prior to 1500 feet on finals. Use of cabin air at other times or on the ground will cause excessive heat and smell in the cabin, and possibly damage the secondary heat exchangers.

Procedures

Before Departure

1. Trip CB B21- Ground Cooling Fan supply.
2. Master Air Conditioning valves 'Close' at all times.
3. Cabin pressure controller - set at least 1000 ft above airfield altitude.

Entering Runway

1. Air delivery valve - Close.
2. Air crossfeed valve - Close.
3. Master valves - APU.

After Take-off

1. Initiate Cabin air at 500 ft.

Descent

1. Cabin Selector - Set at 1500 ft above airfield.

Final Approach

1. Air Delivery valve - Close.
2. Air Crossfeed valve - Close.
3. Master valves - APU.

After Landing

1. Air Conditioning:

   Air delivery valve - Close.
   Air crossfeed valve - Close.
   No.1 Master valve - APU.
   No.2 Master valve - APU.

PLANNED FLIGHT WITH AIR SUPPLY SYSTEM UNSERVICEABLE

Operate as normal, except:

After Take-off

Air Conditioning:

a) No ice (After 3000 ft QFE)
   1. No. 2 Master valve - Open.
   2. No. 2 Master valve - Open.
   3. Air Crossfeed - Open.
   4. Air Delivery valve - Close.
   5. Anticing - Airframe off, Engine as required.

b) In Icing (After power cut-back)
   1. Master Valves - One Open (Preferably side with operative air supply) One Closed.
   2. Air Crossfeed Valve - If air conditioning and anticing available on the side with operative air supply, CLOSE. If either are not on the same side, OPEN.
   3. Air Delivery Valve - Close.
   4. Airframe Antice Valves One Wing and tail open (preferably side with operative air supply). One Wing and tail closed.

Note: Airframe anticing requirements should be considered when operating with an unserviceable air system.

FLIGHT WITH APU UNSERVICEABLE

Operate as normal, except:

After Take-off

Air Conditioning (After power cut-back)
1. No. 2 Master valve - Open.
2. No. 1 Master valve - 5 second pause, then - Open.
3. Adjust power to maintain 70% to 3000 ft QFE.

LEADING PARTICULARS AND LIMITATIONS

The aircraft is cleared for unrestricted operation in icing conditions.

Engine air pressure,	minimum acceptable	45 psi.
	controlling range	45-57 psi.
	maximum	60 psi.
Wing and tail temperature,	normal range	150°-230°C.
Pitot heater nominal consumptions,	Port, stbd, stbd lower	4.0 amps. 5.0 amps. post mod 34A280
	Q	1.3 amps.
	In severe icing conditions pitot heads may draw 9.0 amps, initially higher.	
Windscreen wipers,	maximum speed	220 kt IAS.
After being switched off, windscreen and side window heating must not be switched on in flight at temperatures below		Minus 30°C.
Minimum engine rpm to maintain adequate anticing during descent		9,300 rpm
Rain Repellant system	Inoperative	

MWS FUNCTIONS

Red - Ice Warning
Amber - Windscreen Overheat
Windscreen Underheat

ANTICING

BEFORE TAKE-OFF

With certain exceptions, all surfaces must be free from all forms of snow, frost and ice. The only exceptions are:-

1. The undersurface of the wings, where frost and ice are permissible in the area of the fuel tanks to a maximum depth of 3/8 in.

2. The fuselage, where thin hoar frost is acceptable away from the static vents.

   Thin hoar frost is a uniform white deposit of fine crystalline texture, which usually occurs on exposed surfaces on a cold and cloudless night, and which is thin enough to permit surface features beneath it to be distinguished, such as paint lines, markings or lettering. THIS DOES NOT INCLUDE RIME ICE FORMED ON WINDWARD SURFACES IN FREEZING FOG.

Use of APU During Ground De-icing

If the APU is running during ground de-icing, close the air conditioning Master valves and the APU Air Delivery valve to avoid the possibility of toxic fumes being drawn into the cabin.

Engines

Anticing must be on for taxying and take-off when OAT is below + 10°C and

1. Visibility is below 1000 m, or

2. Runway is wet, or

3. Icing conditions are present.

Additionally, when OAT is below + 1°C the engines should be run at 11,000 rpm for 5 seconds, at intervals of not more than 8 minutes during taxying, before take-off.

Start/Relight switches must be set to 'Relight' before take-off power is applied:

1. When the runway is very wet (at any OAT) or
2. When there is snow or slush on the runway or
3. When there is precipitation (at any OAT).

They must be set to 'Off' in accordance with the After Take-off Drill.

Airframe (Wings and Tail)

A ground test is required on the first flight of the day, and if icing is anticipated:

Wing and Tail Antice switches - Select each to Test in turn, check Air System pressure drops.

An Antice switch should not be held to Test for more than 10 seconds.

Anticing must be off on the ground, and during take-off.

Windscreen

Heating switch must be at 'High', on the ground,

1. In icing conditions, or
2. If TAT is -15°C or below, or
3. If the underheat warning lamps are on with the switch at Normal.

TAXYING ON ICY AND/OR SLIPPERY TAXIWAYS

If, when taxying with Forward Idle, the wheel braking is ineffective, and the safety of the aircraft is hazarded, select Reverse Idle. Only if this is ineffectual should Reverse Thrust be used as necessary to bring the aircraft to a halt.

TAKE-OFF FROM CONTAMINATED RUNWAYS - PUDDLES

Observe the limitations and procedures described below.

PUDDLES Less than 12mm deep and 6m (20 ft) long on the intended take-off run

Treat as normal wet runway

1. Use Standard Thrust
2. Use wet V_1.
3. Select Engine anticing On if OAT below + 10°C.
4. Select Relight switches On.

PUDDLES 12mm to 20mm deep or exceeding 6m (20 ft) long on the intended take-off run

Take-off at Captain's discretion.

NOTE: Consider particularly the number and position on the runway in relation to the intended take-off run; the consequences of encountering pools of excessive depth can be particularly serious when this occurs during the later stages of the take-off run.

1. Lift dump must be serviceable.
2. Wheelbrake system must be fully serviceable.
3. Both thrust reversers must be serviceable.
4. Select Fan intake shutter Shut.
5. Select standard thrust.
6. Use wet V_1
7. Select Engine anticing On if OAT below + 10°C.
8. Select Relight switches On.
9. Do not make a rolling start.

PUDDLES More than 20mm deep of any length on the intended take-off run.

Do not take-off. There is a risk of engine malfunction due to water ingestion.

TAKE-OFF FROM CONTAMINATED RUNWAYS - UNIFORM FLOODING

Observe the limitations and procedures described below.

UNIFORM FLOODING Less than 3mm deep

Treat as normal wet runway.

1. Use Standard Thrust
2. Use wet V_1.
3. Select Engine anticing On if OAT below +10°C.
4. Select Relight switches On.

UNIFORM FLOODING 3mm to 12mm deep (see NOTE).

Take-off at Captain's discretion providing OAT does not exceed ISA.

NOTE: This condition is extremely unlikely as a result of rain alone, unless a cross-wind is preventing adequate drainage of torrential rain.

1. Lift dump must be serviceable.
2. Wheelbrake system must be fully serviceable.
3. Both thrust reversers must be serviceable.
4. Use Snow and Slush TOW from Vol III.
5. Do not take-off with a tailwind component, max crosswind component 12 kts.
6. Select fan intake shutter shut.
7. Select standard thrust.
8. $V_1 = V_R - 5$.
9. Select Engine anticing On if OAT below + 10°C.
10. Use flaps 18°.
11. Select Relight switches On.
12. Do not make a rolling start.

UNIFORM FLOODING 3mm to 12mm and OAT more than ISA.
or
more than 12mm at any OAT.

Do not take off - Snow and Slush TOW's are invalid above + 18°C and there is a risk of engine malfunction when more than 12mm of uniform flooding exists.

TAKE-OFF FROM CONTAMINATED RUNWAYS - SLUSH OR SNOW

If there is any doubt about the condition of the snow on the runway, it must be treated as slush, especially when the OAT is above -5°C. A mixture of snow and slush must be treated as slush. As a guide, half an hour of moderate snowfall would add less than 3mm of slush.

Observe the limitations and procedures described below.

1. Runway clearance: The minimum acceptable cleared width for take-off is 30m (100 ft).
2. Snowbanks:
    a. If the cleared width is less than 36m (120 ft), the snowbanks must not exceed 50cm (19 inches) height.
    b. If the cleared width is 36m (120 ft) or greater, the snowbanks should not exceed 90cm (36 inches).
    c. If the full width is cleared, snowbanks should not greatly exceed 90cm (36 inches).
3. Visual guidance for take-off must be available from any of the following:

    Centre-line lighting, centre-line paint markings, runway edge lighting or runway edge markers/markings.
4. Rotation may require a rather more firm backward pressure than normal, but care should be taken not to over-rotate. In emergency the aircraft can be lifted off a speed as low as V_R -5.

/Cont'd. ...

5. Systems and Procedures:

SLUSH Less than 3mm deep or DRY SNOW Less than 12mm deep

No significant effect on performance

1. Lift dump must be serviceable.
2. Wheelbrake system must be fully serviceable.
3. Both thrust reversers must be serviceable.
4. If cleared width less than 36m, crosswind limit 12 kt.
5. Select Fan intake shutter Shut.
6. Select Standard Thrust.
7. Use wet V_1.
8. Select Engine anticing On.
9. Select Relight switches On.
10. Do not make a rolling start.

SLUSH 3mm to 12mm deep or DRY SNOW 12mm to 40mm deep

1. Lift dump must be serviceable.
2. Wheelbrake system must be serviceable.
3. Both thrust reversers must be serviceable.
4. Use snow and slush TOW from Vol III.
5. Maximum crosswind 12 kt, 6 kt if cleared width less than 36 metres.
6. Do not take-off with a tailwind component.
7. Select Fan intake shutter Shut.
8. Select Standard Thrust.
9. $V_1 = V_R - 5$.
10. Select Engine anticing On.
11. Use flaps 18°.
12. Select Relight switches On.
13. Do not make a rolling start.

DRY SNOW 41mm to 50mm deep

1. As for dry snow 12mm to 40mm deep EXCEPT:

   Use additional weight restriction in snow and slush TOW in Vol III, as described.

SLUSH More than 12mm deep, or DRY SNOW More than 50mm deep

Do not take-off.

AFTER TAKE-OFF

Engines

Anticing must be switched in, of not already on,
1. Immediately ice warning lamp lights
2. If any other indication of icing is observed.

NOTE: If an engine is shut down while the ice warning lamp is 'ON', that engine's anticing must not be switched 'off' until clear of icing, otherwise the warning lamp will not go out when icing conditions have cleared.

Airframe (Wings and Tail)

In known icing conditions, or after receipt of an ice warning after take-off, the Wing and Tail anticing must be switched on, in that order, by 1,500 ft. QFE.

NOTE: Prior to selecting airframe anticing on, ensure that air conditioning has been selected from APU to engine air.

Windscreen

Heating switch must be a high, in flight,
1. If TAT is -5°C or below or
2. If the underheat warning lamps illuminate

DURING CLIMB, CRUISE AND DESCENT

Engine, Wing and Tail anticing must be switched on, in that order,

1. Immediately ice warning lamp lights
2. If any other indication of icing is observed.

When icing conditions have ceased and the ice warning lamp has gone out, switch off Tail, Wing and Engine anticing, in that order.

Anticing During Descent

With wing and tail anticing On, the minimum necessary rpm is 9,300 rpm; at this setting adequate anticing will be maintained, but cabin ventilation and ROD will be reduced and should be closely monitored, and after 10 minutes maximum at 9,300 rpm select 10,800 rpm for at least one minute to purge cabin air.

One Air Supply System Inoperative

The minimum mains pressure for adequate ventilation is 38 psi.

Unheated Windscreen Limiting Speed

Do not exceed 210 kt IAS below 5,000 ft QNH (below FL100 when increased risk of bird strike is suspected). In turbulence use the recommended Rough Air speed.

APPROACH AND LANDING

Prevention of Ingestion/Flap Damage

Unless diversion to a more suitable airfield is impracticable, do not land on a runway where there is standing water or slush in excess of about 15 mm depth, or snow in excess of about 50 mm depth.

Runway Clearance and Snow Bank Limitations

See 'Take-off, Snow and Slush' section.

Crosswind Components - see Check Lists & Drills.

Landing Distances

When braking action is reported Poor ($\mu = 0.25$ or less) the normal landing distance will be considerably increased.

If the runway surface is extremely slippery (runway classified 'slippery when wet', heavy rain falling, wet ice, or slush) the increase in landing distance at max landing weight, after reducing to V_{AT} at the threshold and using Emerg Reverse thrust until the aircraft has stopped, can be up to 350 metres.

Anticing

When the OAT is below + 10°C, engine anticing must be On if:

1. Visibility is less than 1,000 metres, or
2. The runway is wet, or
3. Icing conditions are present.

Wing and tail anticing should be switched Off at 1,500 ft QFE. When the runway is very wet or covered by snow or slush, Relights must be selected prior to touchdown and switched off after landing. The cooling fan intake shutters should be closed.

Landing on Very Slippery Runway

Place the aircraft firmly on the runway, lower the nosewheels as soon as possible, and delay initial wheel braking slightly to allow the wheels to spin up and to allow full control of aircraft heading and track to be established. Select Reverse thrust as soon as possible and maintain until a safe stop is ensured. With adverse conditions it may be necessary to use and maintain Emerg Reverse thrust to below 70 kt.

If the aircraft tends to slide/drift towards the side of the runway and weathercock, select Reverse Idle immediately, Forward Idle if directional control is not regained; if the drift continues, provided sufficient runway length remains, the Captain may at his discretion apply forward thrust to bring the aircraft back toward the runway centreline. When the aircraft is safely returning toward the centreline, reverse thrust may be re-applied.

After Landing

If the runway surface is contaminated with grit, snow, slush, or standing water, the flaps must not be raised beyond 18°; after shutdown, flaps and engines must be inspected and cleansed as required.

If, with Relight selected, engine HP rpm falls below 5,500, do not open the throttle but immediately close the HP cock.

If wheel braking becomes ineffective during taxying, and the safety of the aircraft is threatened, select Reverse Idle; only if this is ineffective should Reverse thrust be used to stop the aircraft.

IMMINENT OVERRUN

If it appears that the aircraft will not stop before the end of the runway, use Emerg Reverse Thrust. DO NOT ATTEMPT TO RETRACT THE UNDERCARRIAGE. Complete the Imminent Overrun Drill.

OVERSHOOT IN ICING CONDITIONS

Engine anticing may be left on for Overshoots. Relight switched 'OFF' when undercarriage up. Airframe anticing, wings and tail, should be switched on after the undercarriage has been retracted.

ANTICING AFTER ENGINE FAILURE

ENGINES

Engine Anticing may be left 'On' or put 'On' as for two engine flight. The failed engine should have its anticing switch left 'On'.

AIRFRAME

Only the wings and tail switches of the operative engine should be selected or left 'ON'. The failed engine's airframe switches should be selected 'OFF'. Maintain 38 psi duct pressure for adequate anticing protection. For procedures on take-off, approach, overshoot and landing, see Flight Management, Abnormal Handling.

After an engine failure on take-off airframe anticing will not be switched on until at or just below 1500 ft.

Similarly after an engine failure on take-off, the Air Conditioning/Pressurisation must not be supplied from the operative engine until the Minimum Safe Altitude is reached. See Flight Management, Abnormal Handling for procedures.

On the approach the airframe anticing will be switched 'off' at 1500 ft QFE and if the APU is unserviceable the aircraft unpressurised by about 1000 ft QFE. On the overshoot, the airframe anticing will be switched 'on', at or just before 1500 ft QFE and the Air Conditioning/Pressurisation introduced at the Minimum Safe Altitude, as in the case of the Engine Failure on take-off.

GROUND DE-ICING/ANTI-ICING HOLDOVER TIMES

The following table gives a guide to the minimum times that de-icing/anti-icing will be effective. The period of protection will vary, depending on the severity of the particular conditions and visual checks of the wings are required as a back-up to this information. The tailplane condition should be the same as the wing, provided that high access equipment has allowed it to be sprayed from above.

Kilfrost will normally be provided as a mix of 50/50 or 60/40.

GUIDELINE TO HOLDOVER TIMES

WEATHER CONDITIONS						AEA TYPE II FLUIDS				
AMBIENT TEMPERATURE °C	FROST	FREEZING FOG	STEADY SNOW	FREEZING RAIN	RAIN ON COLD SOAKED WING	ANTI-ICING	DE-ICING			AEA TYPE I FLUIDS
						100% (COLD) (SEE NOTE 1)	75/25 (HOT)	60/40 (HOT)	50/50 (HOT)	(SEE NOTE 2)
ABOVE 0	*					8 HRS	5 HRS	4 HRS	3 HRS	3/4 HR
		*				3 HRS	2 HRS	1 3/4 HRS	1 1/2 HRS	1/2 HR
			*		*	1 HR	3/4 HR	35 MINS	1/2 HR	1/4 HR
				*		20 MINS	10 MINS	7 MINS	5 MINS	5 MINS
0 TO -7	*					8 HRS	5 HRS	4 HRS	3 HRS	3/4 HR
		*				1 1/2 HRS	1 HR	50 MINS	3/4 HR	1/4 HR
			*			3/4 HR	1/2 HR	20 MINS	1/4 HR	1/4 HR
				*		20 MINS	10 MINS	5 MINS	3 MINS	3 MINS
-8 TO -10	*					8 HRS	5 HRS	4 HRS	▨	1/2 HR
		*				1 1/2 HRS	1 HR	50 MINS	▨	1/4 HR
			*			3/4 HR	1/2 HR	20 MINS	▨	1/4 HR
-11 TO -14	*					8 HRS	5 HRS	▨	▨	1/2 HR
		*				1 1/2 HRS	1 HR	▨	▨	1/4 HR
			*			3/4 HR	1/2 HR	▨	▨	1/4 HR
-15 TO -25	*					8 HRS	▨	▨	▨	1/2 HR
		*				1 1/2 HRS	▨	▨	▨	1/4 HR
			*			3/4 HR	▨	▨	▨	1/4 HR

NOTE 1: Under extreme cold conditions it may be necessary to heat the neat fluid (60°c max) to give it sprayability.

NOTE 2: No significant increase in holdover time is achieved by strengthening the mix of AEA type I fluids.

NOTE 3: The period of protection will be reduced when the fuel temperature is significantly lower than O.A.T. (ie 10°C or more).

NOTE 4: Anticing and de-icing treatment (type, strength and time of application) will be entered in the tech log except at LHR where this information will be entered into FICO by GOL.)

Cont'd. ...

AEA Type II Fluids (Thickened)

(a) Kilfrost ABC
(b) Kilfrost ABC-2
(c) Hoechst 1704/83 ADF
(d) Hoechst 1704 LTV

These fluids have good de-icing properties and provide protection against re-freezing and the build-up of further accumulation in precipitation. The thickening agent aids retention on the airframe.

AEA Type I Fluids (Unthickened)

(a) Kilfrost DF
(b) UCAR ADF II - Union Carbide
(c) De-icing Fluid C (or 'D') - Union Carbide
(d) Hoechst VP 1732
(e) Dow ADF 1050
(f) Dow 146 AR - Dow Chemical
(g) Aeroshell S5523A - Deutche Shell
(h) Any other fluid conforming to Spec MIL-A-8243

These fluids have good de-icing properties but provide only limited protection against re-freezing.

In addition to the AEA types I and II fluids outlined above, ATP 688 part 2 Ground Handling Booklet "Operations in Snow and Ice Conditions" details the use of other approved Type I fluids used at a small number of specific airports.

Also listed is a fluid which can be applied cold, when all the other approved fluids are not available. It is intended mainly for removing light deposits of frost and ice from underwing areas. Minimal protection is provided against re-freezing and a visual check is required immediately prior to take-off.

Lower Temperature Limitations

(1) AEA Type I Fluids - The freezing point of the AEA Type 1 fluid mixture used for de-icing MUST BE at least 10°C below the ambient temperature.

(2) AEA Type II Fluids - The approved mixture strengths of AEA type II fluids are listed below, together with details of the minimum temperatures at which the various concentrations may be applied to aircraft surfaces:-

Mixture Strength (glycol/water)	Lower Temperature Limit for Application
50/50	$-7^{\circ}C$
60/40	$-10^{\circ}C$
75/25	$-14^{\circ}C$
100/0	$-25^{\circ}C$

Cont'd. ...

(a) When the minimum application temperature for a given AEA type II mix has been reached, either a stronger mix can be used or the aircraft de-iced with that fluid then immediately anti-iced. Any aircraft that has been de-iced can, if required, be immediately anti-iced in order to obtain benefit from the additional holdover times generated.

(b) These temperatures provide a 2½°C to 5°C margin above the temperature at which the fluid becomes a semi-solid 'mush' which could seriously affect the aerodynamic characteristics of the aircraft.

(c) On those occasions where there is a requirement to de-ice with AEA Type II fluids at ambient temperatures below -14°C, neat fluid may be heated in an EMERGENCY and used for de-icing until the temperature again rises above -14°C. This neat fluid can be used for de-icing at ambient temperatures down to -20°C, however, the -11 to -14°C section of the 75/25 hot mix column on the chart must be used to estimate the available holdover time.

(d) Despite the above limitations, the fluid can freeze after application since aircraft skin temperature may be significantly colder than OAT due to radiation overnight or cold soak from a previous flight. Therefore after de-icing the Captain must ensure (or tell the Engineer to ensure), that the fluid is still in liquid form. Also when an aircraft has been anti-iced or de-iced the advice to the Captain should include both the type and strength of fluid used.

e.g. AEA Type II/785 - indicating that 75/25 (fluid/water) mixture has been applied.

ABNORMAL MANAGEMENT

ICE AND RAIN PROTECTION SYSTEMS

EXCESSIVE ENGINE AIR PRESSURE

Symptom - Engine Air Pressure gauge reading over 60 psi.

Action - 1. Operating conditions permitting, throttle back until pressure falls below 60 psi.

LOW ENGINE AIR PRESSURE

Symptom - Engine Air Pressure gauge reading below 45 psi.

Action - 1. Compare with other gauge: if readings are are similar for a given engine speed, no further action.
2. If readings differ, increase speed of suspect engine. If pressure rises to within normal range and no higher, assume system is serviceable.

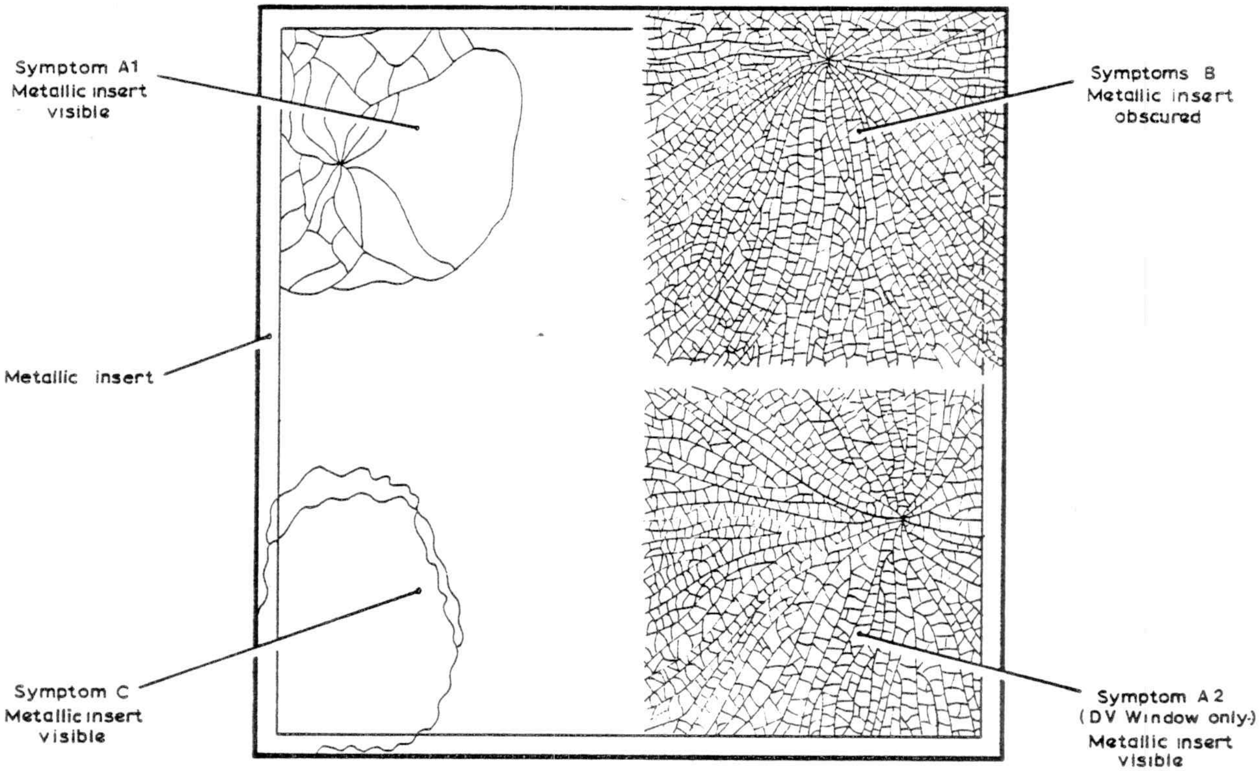
STALL RECOGNITION
SENSOR HEATER FAILURE - See Flying Controls chapter

FLIGHT DECK WINDOW DELAMINATION LIMITS

The following limits of acceptable delamination apply to both fixed and sliding windows.

1. Complete delamination of the area between the periphery of the glass panel and an imaginary boundary 2" inside and parallel to the periphery.
2. Local delamination extending not more than 3" inward from the periphery of the panel and not more than 12" in length.
3. Areas of delamination beyond boundaries 1 and 2, totalling 6 sq ins. provided no single area exceeds 2 sq in.
4. Area of delamination restricted only by an acceptable standard of visibility.

/Cont'd. ...



WINDSCREEN FAILURE SYMPTOMS

WINDSCREEN AND WINDOW FAILURES

Identify the failure from the illustration and symptoms below, enter the table and complete the listed actions.

If a windscreen/sidescreen failure cannot be quickly identified, complete the Unidentified Failure actions.

Symptoms/Failure	Complete actions:		
	Windscreen	DV window or sidescreen	Cabin window
Unidentified Failure	3, 4	3	1, 2
Outer glass failure: Individual cracks radiating from central point, metal rim visible (A1) Total loss of vision, metal rim visible (DV window A2)	4, 5	No action	-
Middle glass failure: Complete loss of vision, metal rim invisible or unidentifiable failure (B)	3, 4	3	-
Inner glass failure: Partial loss of vision (C)	No action	No action	-
Rapid increase in glass/vinyl delamination	2	2	-
Cracked inner panel	-	-	1, 2
Badly scratched or crazed panel	-	-	No action
Visible arcing of heating element or darkening/bubbling of glass	4, 6	7	-
W/S U/heat lamp On more than 3 mins with heating switch at High	4, 9	-	-
W/S U/heat and O/heat lamps On continuously and/or distorted vision, visible hairline crack in heater strip	4, 10	-	-
W/S O/heat lamp On, cycling	8	8	-

/Cont'd. . . .

Action:

1. Cabin notices On. If possible evacuate area within 6 ft of window.
2. Descend and de-pressurise as soon as practicable.
3. Reduce cabin pressure differential to 2½ psi as soon as practible (approx FL150 at 8,000 ft cabin alt).
4. Do not exceed 210 kt IAS below 5,000 ft QNH (below FL100 when increased risk of bird strike suspected). Use Rough Air Speed only if necessary.
5. Reduce cabin pressure differential below 5½ psi as soon as practicable (approx FL250 at 8,000 ft cabin alt).
6. Port windscreen - Trip CBs 82, 66
   Stbd windscreen - Trip CBs 89, 59
7. Port side window - Trip CB 65
   Stbd side window - Trip CB 72
8. Select Low. If lamp remains On, use limitations for unheated windscreen.
9. a. Port windscreen CBs - Check in (82, 66)
   b. Stbd windscreen CBs - Check in (89, 59)
10. Windscreen heating inoperative.

LEADING PARTICULARS AND LIMITATIONS

1. AUTO FLIGHT CONTROL

General Limitations

All auto flight modes must be disengaged for take-off but the 'Autothrottle' and 'A Pilot' switches may be on.

The Autopilot must not be engaged if the Select Speed readout differs by more than 10 kts from the ASIs.

The maximum speed is V_{MO}/M_{MO}.

Except in accordance with the conditions given under ILS Coupled Approach and Automatic Landing, the Autopilot shall be disengaged when the aeroplane is lower than 1000 ft above the terrain or when 45° Flap is selected.

In severe turbulence all manometric locks must be disengaged.

If the Autopilot Auto-Trim is known to be inoperative, the Autopilot must be disengaged and the 'A Pilot' switch set to 'Kill'.

The Autopilot must be disengaged when flying with emergency elevator power or in manual reversion.

If the Autopilot disconnects, 15 seconds must elapse before attempting to re-engage it, and the aircraft must be in trim. Only one attempted re-engagement is permissible after glide path capture. Below 1000 ft above the terrain or after Glide Gearing or Prime Land selection, re-engagement is not permitted.

2. ILS COUPLED APPROACH AND AUTOMATIC LANDING

The Autopilot may remain engaged down to:-

800 ft ARTE provided that -

(a) The Autopilot is coupled to an ILS GP and LOC.

(b) 26° or 45° Flap is selected.

100 ft ARTE provided also that -

(c) Either Glide Gearing or Prime Land is selected.

50 ft ARTE provided also that

(d) The radio altimeter is operative.

TOUCHDOWN provided also that -

(e) Both engines are operative and 45° Flap is selected.

(f) The Autoland fitted placards are displayed.

(g) Prime Land is selected.

(h) The surface wind limitations set out in Check Lists and Drills, Drills 4 are not exceeded.

(i) The Auto Trim warning lamp is not on during the Attitude Hold phase between 100 ft R and 50 ft R.

(j) The runway designator in Operations Manual Vol. III AOM, is annotated (L).

(k) The autoflare computer test is satisfactory.

3. PRIME LAND SELECTION

The following limitations must be observed before making a Prime Land selection:-

(a) The Cat. 2 fitted placards are displayed and the Autopilot and its audio warning systems are fully serviceable.

(b) Autothrottle is engaged.

(c) The surface wind limitations set out in Check Lists and Drills, Drills 4 are not exceeded.

(d) The airfield temperature does not exceed ISA + 25°C.

(e) Turbulence below 250 ft is not expected or reported greater than that normally associated with the above wind and temperature limitations.

/Cont'd. ...

(f) The runway designator in Operations Manual Vol.III, AOM is annotated (L) or Cat.2 AOM are published.

(g) The radio altimeter is operative.

4. ILS COUPLED APPROACH AND AUTOMATIC LANDING - CAT.2

In addition to the limitations in 2 and 3 above, the following limitations must also be observed if operating to Cat.2 AOM.

(a) Prime Land must be selected.

(b) The ILS GP and LOC must be reported to be operating within Cat.2 limits.

(c) If one engine is inoperative, the failure did not occur during cruise.

(d) The following must be serviceable at Localiser acquisition:

(1) Both Radio Nav Systems.

(2) Both Attitude Directors, with their Attitude and Flight Director Fail flags clear.

(3) Both Flight Compasses.

(4) Radio deviation comparator (Mode Indications).

(5) Radio Altimeter System.

(e) The Airfield Temperature does not exceed ISA + 10°C.

(f) The Power Failure Warning Light on panel RA must be out.

5. ILS COUPLED APPROACH AND AUTOMATIC LANDING - CAT 3A

(a) In addition to the limitations in 2, 3 and 4 above, the following limitations must also be observed if operating to Cat 3A AOM.

(i) An autoland must be carried out, except that if the autopilot disengages below decision height, and adequate visual reference is maintained, a manual landing may be carried out.

(ii) The ILS must be reported to be operating within Cat 3 limits.

(iii) Both engines are operative.

(b) The requirement for continuing a Cat 3A approach below decision height is that the Captain can see the touchdown area and has adequate visual reference to complete a manual landing in the event of an autopilot disconnect.

6. AUTOTHROTTLE

(1) Autothrottle speed setting should not be changed after Prime Land is selected.

(2) If the Autothrottle disconnects after Prime Land or Glide Gearing selection, it must not be re-engaged for that approach.

(3) The Autothrottle must be disengaged for a manual landing flare.

7. MALFUNCTIONS ON FINAL APPROACH
(Prime land selected)

	RVR Cat 2 or 3	RVR Cat 1 or better
Any FCS Malfunction (e.g. FD failure, FD* or Att flags appear, A/P or A/Throt discon.)	Overshoot	Revert to Cat 1 DH.
ILS Signal Failure (Beam and/or GP flag/s pulse together with flashing Beam and/or GP mode indicators)	Overshoot	If possible switch to serviceable Nav receiver and revert to Cat 1 DH. If ILS failed - overshoot unless visual.
ILS Deviation GP or AZM flash in mode indicator.	Above 200'R - continue. Below 200'R - overshoot.	Monitor deviation and continue to Cat 1 DH.

* The appearance of the FD flag without the FD parking can indicate failure of the ILS signal. Overshoot is required in Cat 1 conditions unless visual.

8. UNSERVICEABLE ILS/VOR RECEIVER

If an instrument approach is to be made with one Nav receiver unserviceable, special attention should then be paid to monitoring the localiser track-keeping by cross-checking with other aids, e.g. NDB's PAR or SRA.

FLIGHT DIRECTOR

The Flight Director must not be used as the sole means of reference. This is particularly important during initial climb.

ALTIMETER TOLERANCES

Altitude Ft x 1000	Altimeter Tolerances Ft ±	
	SERVO	STAND-BY
-1)	30	70
0)		
1)		
2	30	80
3	30	90
4	35	90
10	35	150
15		250
20	50	350
25		450
30	75	500
QFE setting tolerance	±30	±50

The maximum indicated differences can be obtained by adding the maximum calibration error tolerances.

WEATHER RADAR

With power on, a range must not be selected if the aircraft is:-

Within a hangar -

Refuelling or defuelling -

Pointing at people within the aerial scan and 100 ft of the radome -

Pointing at any large reflecting surface e.g. other aircraft, hangars, walls within the aerial scan and 50 ft of the radome.

COMPASS SYNC BUTTONS

The Sync button may be pressed in flight only when that compass is uncoupled from the autopilot and the aircraft is in level flight at unchanging speed.

STANDBY HORIZON

Do not press fast errect button within 30 seconds of power being supplied (i.e. opening an H. P. cock) or for longer than 1 minute, or during turns in flight.

MWS FUNCTIONS

Red - Autothrottle disconnect after Glide Path capture
Amber - FD ATT warning.

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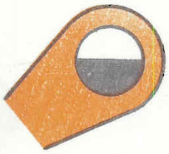
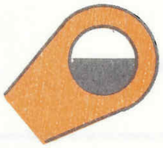
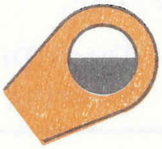
FCS



Press Att Fail Flag Reset button.
If flag not cleared, disregard attitude display; F/Dir, BEAM & GP flags remain serviceable.
If Port Attitude Fail Flag, autopilot may be unreliable - monitor.

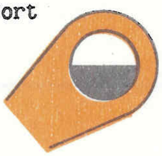
FAILURE. Attitude display difference between that instrument and the other and the F. Director VG3.

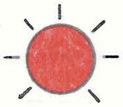


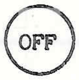


Press Att Fail Flag Reset buttons.
Check 'Att Comparator DC' cb 410 on panel RA.

FAILURE. Flag coil supply on both attitude displays.



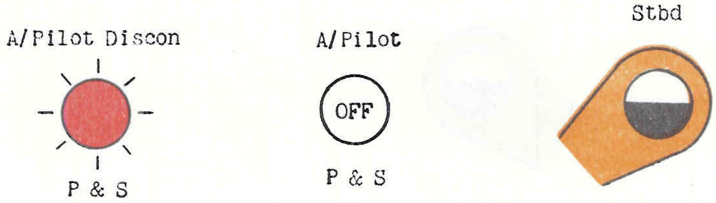




A/P Engage switch disengaged.
A/Pilot Discon horn sounding.

Check 'Att 1' cb 468 on panel RB.

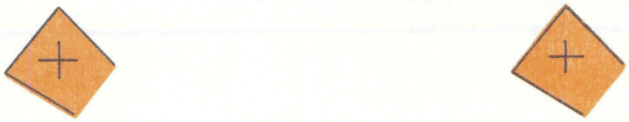
FAILURE. VG1 toppled.



A/P Engage switch disengaged.
A/P Discon horn sounding.

Check 'Att 2' cb 479 on panel RB.

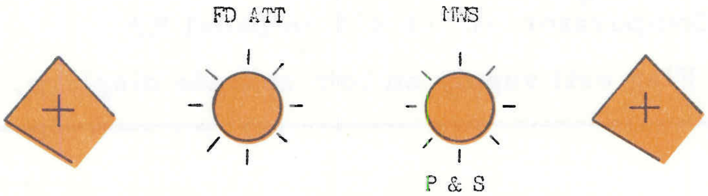
FAILURE. VG2 toppled.



F/Dir switch disengaged and FD Index parked.

Check 'Steer Comp AC' cb 453 on panel RA - Switch on F/Dir.

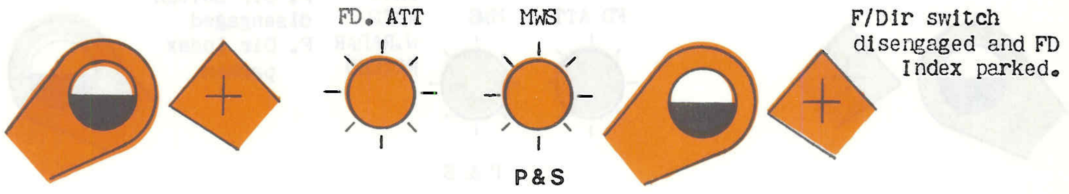
FAILURE. Pitch Directors hit stops - Steering Computer.



F/Dir switch disengaged and FD Index parked.

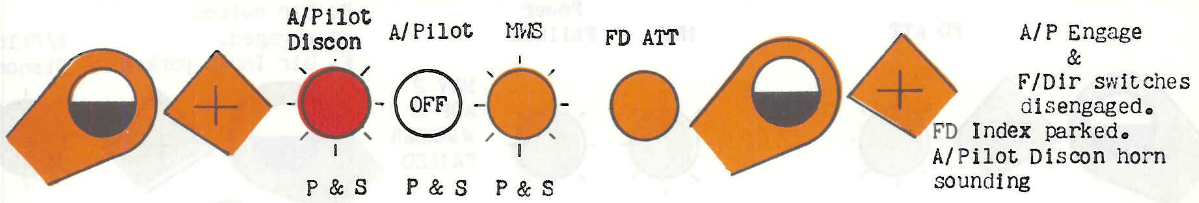
Check 'V. Gyro 3' cb 455 on panel RA - Switch on F/Dir. if serviceable. If not, select Stab Off at W. Radar Controller.

FAILURE. VG3.



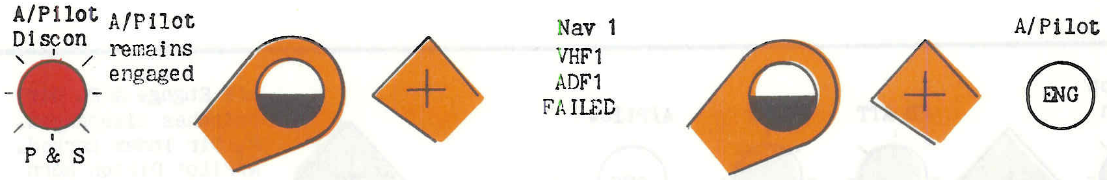
Check 'Attitude Comp AC' cb 476 on panel RB.
Both Att. Directors may still be serviceable.
S. By Horizon/basic insts should be monitored continuously
Autopilot may be unreliable-monitor continuously.

FAILURE. Attitude Comparator, or discrepancies between two or more Attitude Systems.


A/Pilot Discon
A/Pilot
OFF
MWS
FD ATT
P & S
P & S
P & S
A/P Engage & F/Dir switches disengaged.
FD Index parked.
A/Pilot Discon horn sounding

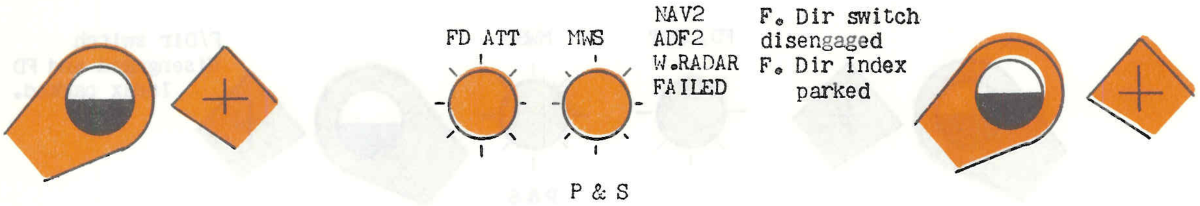
Check 'Att 1' & 'Att 2' cb's 468 & 479 on panel RB, check 'VG3' cb 455 panel RA. STANDBY instruments should be used for Attitude reference.

FAILURE. Two Or More VG'S.



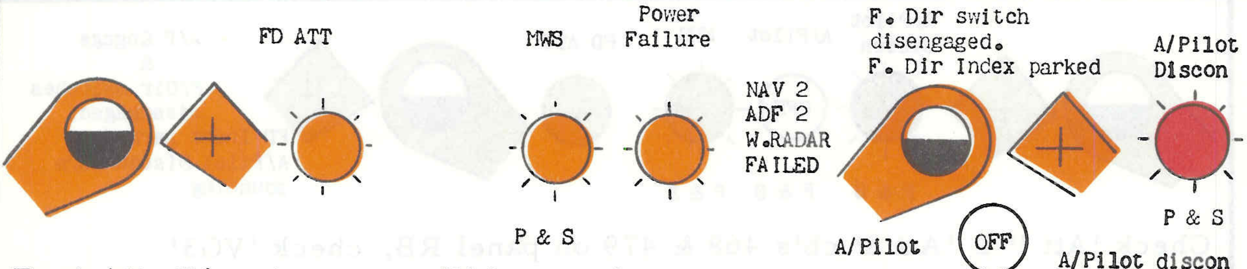
Check 'Essential Radio' cb 254 on panel B.

FAILURE. Ess Radio & Electronic DC Bus power



Check 'Radio Power No 2' cb 15 on panel RB.

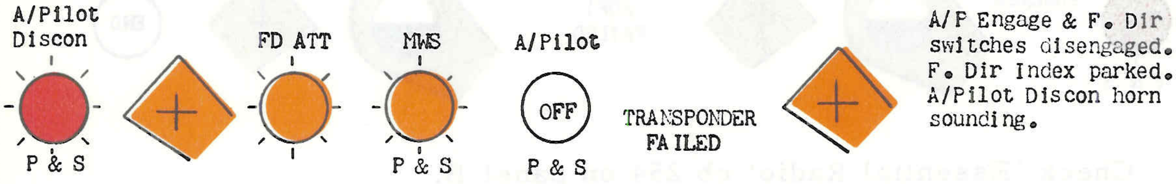
FAILURE. Radio & Electronic AC Bus 2 power.



Port Att. Director may still be serviceable

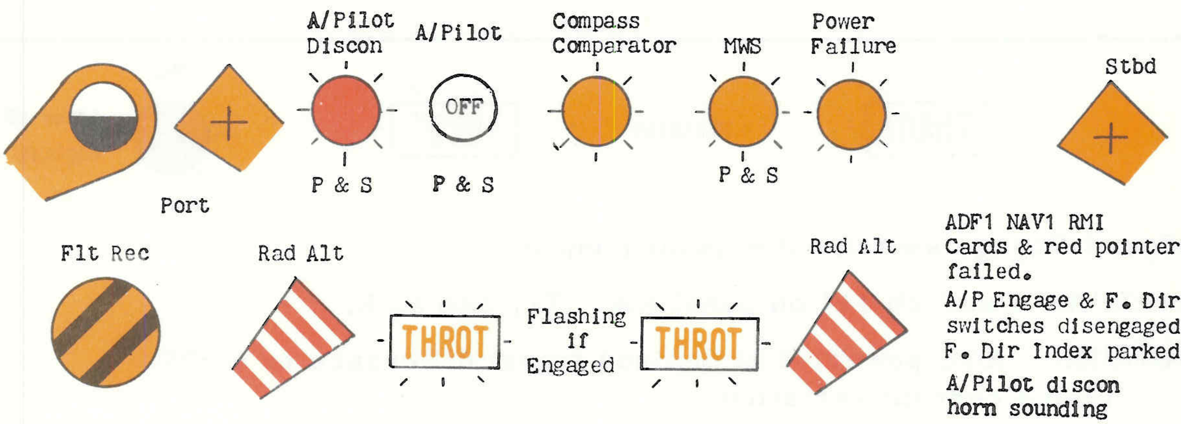
Check 'Radio Power No. 2' cb 16 on panel RB.

FAILURE. Radio & Electronic AC Bus 2 power when R & E Bus Relays relaxed.



Check 'Radio DC No 1' cb 157 on panel B.

FAILURE. Radio & Electronic DC Bus 1 power.



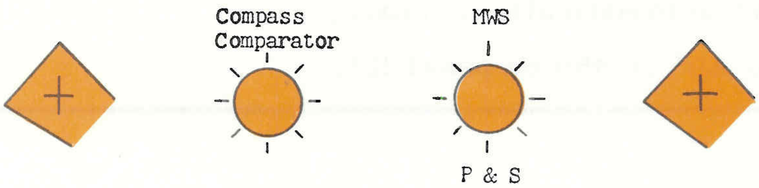
ADF1 NAV1 RMI Cards & red pointers failed.

A/P Engage & F. Dir switches disengaged.

F. Dir Index parked.

A/Pilot discon horn sounding

Check 'Radio Power No. 1' cb 14 on panel RB.
FAILURE. Radio and Electronic AC Bus 1 power.



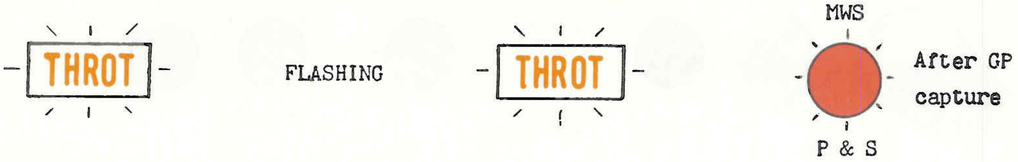
Check Compass and Compass Amp cb's 466, 467, 474, 475 on panel RB;

After 1 minute of straight & level flight, identify faulty compass by reference to stand-by and try to synchronise. If unsuccessful -

Select serviceable compass at Flight Controller.

Select DG on faulty compass to cancel warnings.

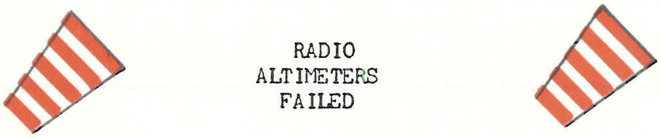
If stbd compass has failed, transpose plugs at 'Compass Transfer' sockets on panel RA, to supply RMI cards.



If Speed Engage switch not manually put off -

Check 'Air Data' cb 444 on panel RA. Try IAS lock.

FAILURE. ADC power, 4 kt demand signal difference or ± 50% clutch current variation.



Autopilot will disconnect if Prime Land selected.

Note. GPWS automatically inhibited.

Check 'Rad Alt' cb 450 on panel RA.

NAV SYSTEMS, DME & RMI

NO AUDIO, BEAM FLAG, RMI OR COMPASS PRESENTATION; DME DISTANCE INDICATOR ORANGE/WHITE BAR SHOWING

Check relevant 'Nav 1 Rx' cb 417 or
'Nav 2 Rx' cb 430 on panel RA.

COMPASS & FLT DIR NAV PRESENTATION ABNORMAL

Set FCS Radio Input switches; Port - Nav 1; Stbd - Nav 2.
Compass switch Port or Stbd as required.

If switches already set as above, try exercising them.

DME DISTANCE INDICATOR ORANGE/WHITE BAR SHOWING

Check relevant 'DME 1 syst' cb's 420 & 449 or
'DME 2 syst' cb's 433 & 463 on panel RA.

NO GP FLAGS - BEAM FLAGS STEADY

Check 'G/P1' cb 418 or
'G/P2' cb 431 on panel RA.

STBD COMPASS & BOTH RMI CARDS FAILED

Check 'Compass 2' cb 475 on panel RA.

If stbd compass U/S, to restore heading to RMI cards, Nav systems and Omnitrac, transpose plugs at 'Compass Transfer' sockets on panel RA.

If VOR QDM required before above action -

Set relevant FCS Radio Input switch -
Rotate associated Track Pointer Head
until VOR 'TO' presentation aligned with it -
Read QDM off 360° counter.

MARKERS

NO SIGNALS AURAL OR VISUAL	Check MKR1 or MKR2 cb's 416 or 429 on panel RA.
AURAL BUT NO VISUAL SIGNALS	Check 'HI' selected at height, or filament.

Intentionally left blank

OMNITRAC

1. System Dead No lights. No chart movement. No distimeter movement.	1. Trip and Reset Cb's 438 and 439 on Panel RA ———— 2.
	2. If system becomes normal, Report Intermittent start if neither Cb. found tripped. If fault remains, Select OFF on Flight Log controller. Report System dead. If time available, repeat drill in cruise.
2. Distimeter will not display correct route number.	1. Check correct roll fitted. (Below 257 - German Above 256 - U.K.) Set up for manual operation. Report Distimeter will not show correct. route number. Record desired route number(s).
3. Incorrect initial positions after route number insertion. a) Continuous roll movement. b) End of roll displayed. c) Incorrect position displayed.	1. Check correct roll fitted. (Below 257 - German Above 256 - U.K.) Check correct route number (Vol III list). Check chart response to N/S buttons —— 2.

3. Incorrect initial positions after route number insertion. (Cont'd.)	2. If response correct, Set up for manual operation. Report Incorrect start position. Record route no., Symptom, and chart number if symptom (c). If response incorrect, Select OFF at F. Log. controller. Report Incorrect control button response - Start.
4. Cursor moves to incorrect position when update button pressed following auto or manual setting up.	1. Select 'FIX', Reposition Cursor, Reselect 'OP' Press update button ——— 2.
	2. If system normal, no further action. If cursor returns to incorrect position, Select 'HARCO INT' on F. Log. controller. Select 'FIX', reposition cursor, reselect 'OP'. When in GOOD Decca cover, reselect 'HARCO'. Press update button when short flashes occur ——— 3.
	3. If system now normal, Report Incorrect lane resolution - Start Record route no., Initial Chart, False Position, GMT.

/Cont'd. ....

4. Cursor moves to incorrect position when update button pressed following auto or manual setting up. (Cont'd.)	If positions still false, Reselect 'HARCO INT'. Select 'FIX'. Reposition Cursor. Select 'OP'. Operate in 'HARCO INT' monitoring position using other aids. Report False position on chart. Record route no., Chart No's. Position error.
5. In flight: Incorrect position, no lights.	1. If coupled, check Waypoint 1. Check N, E, S, W chart control buttons —— 2.
	2. If button response abnormal, Select OFF on F. Log controller. Report which buttons faulty. If button response normal, Check 'HARCO' and 'OP' selected on Flight Log controlled. Check performance of autopilot coupling against other aids —— 3.
	3. If autopilot coupling normal, Select 'OFF' on F. Log controller. Report False Position and coupling normal. Record Chart and route nos. Position error(s). If autopilot coupling abnormal, Select 'OFF' on F. Log controller. Report False Positions and coupling. Record Chart, Route No. Position error(s).

6. In flight: Amber lamp
Short Flash

1. Select 'Check'.

Press and hold update button.

Observe cursor movement ———— 2.

2. If movement small, or nil,
Reselect 'OP'.
Press update button ———— 3.

If movement significant, but new position correct,
Reselect 'OP'.
Uncouple.
Press update button.
Recouple after 5 seconds ———— 3.

If movement is to an incorrect position,
Reselect 'OP'.
Do not update.
Monitor operation against other aids.
Report Incorrect lane resolution - Flight.
Record Chart No., Cursor positions
in 'OP' and 'CHECK'.

3. If flash ceases,
No action.

4. If flash continues for more than 1 minute and cursor agrees with aircraft position -

Select 'Harco Int'.
Flash should now cease.

7. In flight: Amber lamp Long flash for more than 90 seconds.

1. Check Cb. No. 439 on Panel RA.

Check 'OP' and 'HARCO' selected on F. Log controller.

Check Decca coverage adequate (and serviceable).

Observe Zone Ident. meter ——— 2.

2. If Zone Ident cycle normal,
   Report Long flash - Zone Ident normal.
   Record Chart No(s), GMT ——— 3.

If Zone Ident light flash sequence abnormal,
   Report Long flash - Zone Ident normal. abnormal.
   Record Chart No(s), GMT, abnormal indications ——— 3.

If pointer not within 2 divisions of 12 o'clock at start of cycle.
   Report Long flash - Zone Ident. reference abnormal.
   Record Chart No(s), GMT, reference pointer position ——— 3.

3. Use system in memory mode with caution, monitoring against other aids.

Select 'OFF' on both controllers if position error apparent.

8. In flight: Amber Lamp ON STEADY

1. Uncouple.

2. Remain in 'OP'.

Drive roll in original direction, through desired chart onto next chart, then release ——— 2.

3. If system now normal,
(Amber Lamp will long flash if chain changed).
Report Short constants misread.
Record Chart No., and position.

If amber lamp remains steady,
Select 'FIX'.
Drive roll in original direction, through next set of long constants, then back to correct position.
Select OP ——— 3.

4. If amber lamp remains steady,
Select 'OFF' at F. Log controller.
Report Steady amber lamp.
Record Route no., Chart No. where fault occured.

If amber lamp long flash,
Wait till short flash recurs (50 secs).
Press update button.
Check correct position displayed.
Continue in manual operation: do not reselect a route number.
Couple as required.
Report Long flash - Zone Ident.
Record route no., Chart No. where fault occured.

9.	Coupled flight Incorrect tracking	1.	Check Waypoint 1. Check Track Offset Selector. Uncouple, wait 5 seconds, recouple. If fault persists, do not use coupling. Report Incorrect tracking. Record Chart No., WP1 Tracking Error.
10.	Coupled flight Wing rock during steady state operation.	1.	Trip Cb. No.439 on Panel RA. Observe coupling whilst in memory —— 2.
		2.	If rocking ceases, Report Wing rock on Harco only —— 3. If rocking continues, Report Wing rock on Harco and Memory —— 3.
		3.	Do not use coupling. Reset Cb No Record Chart No(s).
11.	Distimeter:- Sticking Digits	1.	Report Sticking Distimeter digit. Record which digit(s) faulty.

12.	Distimeter:- Incorrect Information	1.	Report Distimeter logic faulty. Record Chart No., Indicated Distance, Groundspeed and Time to WP1. True Distance and Groundspeed at same instant (as determined by other aids).
13.	Coupled flight: Wing rock during chart changes	1.	Report Wing rock during chart changes. Record route no., Chart Nos. at start and end of chart change.
14.	Coupled flight: Wing rock when coupling first selected	1.	Report Wing rock when coupling first selected. Record Chart No.

UNSPECIFIC FAULTS WITH OR WITHOUT WARNING LIGHTS

Select off at both controllers for 30 seconds then -

Select Fix, read in long digit track, position cursor -

Select Op.

Alternatively, trip and reset cb 439 panel RA without switching Off.

FAILURE OF HEADING, HEIGHT OR IAS INPUTS TO OMNITRAC

Stbd Compass failure -
Facilities affected
before Compass C/O

1. Relative bearing
2. Wind vector thus Time to Go
3. Position in DR mode
4. Distance to Go in DR mode
5. Autopilot damping

1. The RBI will stop if there is no heading signal, or give a false bearing from a false heading signal.

2. Wind vector would continue to be calculated on the heading on which compass failed and would be correct until alteration of course.

3. DR position would be wrong after course or track change.

4. Distance to go would be accurate when not in DR mode or 'Harco Int'.

5. Omnitrac demands to the Autopilot would cause oscillation about the mean without reference to the heading.

Stbd Altimeter failure -
Facilities affected

1. Slant range position correction thus Distance to Go
2. TAS calculation therefore

    Wind vector
    DR position
    Time to Go

1. Phase relationship varies in the vertical plane as well as the horizontal. If no allowance made for height, error may be 1 n.m. per 20,000 ft.

IAS signal failure -
Facilities affected

1. TAS calculation therefore

    Wind vector
    DR position
    Time to Go

ADF & RMI

NO AUDIO OR RMI PRESENTATION

Check 'ADF1' or 'ADF2' cb's 402 or 428 on panel RA.

AUDIO BUT NO RMI PRESENTATION

Set Function Switch to 'Loop', operate 'Loop' control. If RMI pointers move, try manual/aural D/F if required.

STBD COMPASS & BOTH RMI CARDS FAILED

ADF relative bearings remain available on both RMI's.

Check 'Compass 2' cb 475 on panel RA.

If stbd compass U/S, to restore heading to RMI cards, transpose plugs at 'Compass Transfer' sockets on panel RA.

WEATHER RADAR

MALFUNCTION OR FAILURE

Check 'W. Radar DC' cb 436
"W. Radar AC' cb 482 on panel RA.

Note: After a power supply interruption there will be the normal two minutes delay before a display re-appears. See Power Failure warning lamp, panel RB.

NO DISPLAY

Select 'Standby' and back to range in use. Try all ranges; if necessary, wait a few minutes and try again. If display does not return, check Tx/Rx unit fuses when able, on panel RC, electrical bay.

If the display returns and fails again later, check Indicator and Tx/Rx cooling.

ATC TRANSPONDER

MONITOR LAMP DOES NOT LIGHT ON TEST	Check 'ATC 1 & 2 Tx' cb 415 on panel RA. Select other system at 1-2 switch.

FLIGHT RECORDER

MI OSCILLATING BETWEEN ON & FAIL	Select 'Unit Test' and PU, WR, (EN on G-AVMR only), in turn, noting reaction on MI. 'ON' indicates selected unit is serviceable, possibly faulty otherwise.

Note: It is essential that the above check is done in the air and details entered in the technical log.

MI SHOWS FAIL	Check 'Flt Rec' cb 443 on panel RA.

AUTO TRIM WARNING LIGHT

If the Auto Trim warning light stays on during an ILS approach, manual trim may be used to assist return to an in-trim condition.

Operation of the light should be entered in the technical log and marked "For Information".

INSTRUMENTS

Failure of -	Check -
SERVO ALTIMETER (port)	'Altimeter Left' cb 30 panel B
SERVO ALTIMETER (stbd)	'Altimeter Right'cb 92 panel B
S.BY HORIZON	'Standby Gyro Horizon' cb 26 panel B
TURN & SLIP (port)	'Turn & Slip Left' cb 41 panel B
TURN & SLIP (stbd)	'Turn & Slip Indicator Right' cb 68 panel B
TOTAL AIR TEMP GAUGE	'Outside Air Temp' cb 147 panel B
FL100 LAMPS	'FL100 Warning' cb 252 panel B
Q PITOT HEATER (port)	'Pitot Heater Q Left' cb 49 panel B
Q PITOT HEATER (stbd)	'Pitot Heater Q Right' cb 57 panel B
PITOT HEAD HEATER (stbd)	'Pitot Heater Right' cb 109 panel B
PITOT HEAD HEATER (lower stbd)	'Pitot Heater Right (Lower)' cb 150 panel B
PITOT HEAD HEATER (port)	'Pitot Heater Left' cb 369 panel P

STATIC PRESSURE SUSPECT

Select 'Alternative' at relevant Static valve.

RADIO POWER

DIRECTOR & ATTITUDE FLAGS SHOWING & SIMULTANEOUS FAILURE OF VHF 1 - ADF 1 - NAV 1 - DME 1 CABIN ADDRESS.	Check 'Essential Radio' cb254 on panel B.
DIRECTOR & ATTITUDE FLAGS SHOWING & COMPASS COMPARATOR W/LT ON - SIMULTANEOUS FAILURE OF NAV 2 - DME 2 ADF 2 - WEATHER RADAR.	Check'Radio Power No. 2' cb15 on panel B.
DIRECTOR FLAGS SHOWING & SIMULTANEOUS FAILURE OF MODE INDICATOR - ATC T'PONDER. DME 1	Check 'Radio DC No. 1' cb157 on panel B.
SIMULTANEOUS FAILURE OF VHF 2 - NAV 2 - DME 2 ADF 2 - WEATHER RADAR - OMNITRAC.	Check 'Radio DC No. 2' cb158 on panel B.

POWER FAILURE WARNING LIGHT ON - ALL SYSTEMS NORMAL - GENS 1 & 2 OR APU GEN ON LINE.	Check 'Undervoltage Unit' cb489 on panel RB and 'Radio Power No. 1' cb13 on panel B. If either or both of these cb's cannot be re-set, all FCS & Radio systems still remain available, fed from 2, or 1 & 2, Main AC Bus.
RMI CARDS & RED POINTERS FAILED - NAV 1 BEAM FLAG DISAPPEARS - NAV 1 DISPLAY FAILED - PORT HEADING INDEX DOES NOT CONTROL F. DIR OR AUTOPILOT.	Check '26V AC Trans 1' cb446 on panel RA and 'Essential Radio' cb29 on panel B.
RMI GREEN POINTERS FAILED - NAV 2 BEAM FLAG DISAPPEARS - NAV 2 DISPLAY FAILED - STBD HDG INDEX DOES NOT CONTROL - F. DIRECTOR OR AUTOPILOT - MODE IND HT ACQ FLASH FAIL.	Check '26V AC Trans 2' cb454 on panel RA.

COOLING FANS

FANS FAIL W/LT ON	Select alternative - Check cb448 (No. 1) cb460 (No. 2) on panel RA. If both fans have failed, switch Omnitrac Off at the Flight Log Controller. Prolonged lack of cooling may cause Autopilot disengagement.

ABNORMAL MANAGEMENT

CCS

NO SIGNALS OR INTERCOM AT ANY STATION BOX	Check CCE CB's 406 & 432 on panel RA.
NO INTERCOM WITH PANTRIES OR GROUND	Check 'Service Interphone' cb 432 on panel P.

VHF COMS

FAILURE	Check relevant 'VHF1 Tx-Rx' CB 401 or 'VHF2 Tx-Rx' CB 427 on panel RA.

CHANNEL DEAD
SUSPECT AIRCRAFT TRANSMITTER CONTINUOUSLY RADIATING

Set VHF 1 & 2 to the same frequency -

Set all Station Box Selector Switches Off -

At one Station Box Tx/Rx Selector Switch
select VHF1 then VHF2 then Off.

If a note or badly distorted reception is heard at VHF1 and VHF2 positions, leave that Station Box Tx/Rx switch Off; use box only for reception.

If a note or badly distorted reception is heard only at VHF1, switch VHF2 off at the Controller; if heard only at VHF2 switch VHF1 off at the Controller.

If no note etc. was heard, repeat the check at the second and if necessary, the third Station Box.

CABIN ADDRESS

FAILURE	Check 'CA' CB 403 on panel RA.

CALL LAMP SYSTEM

STEWARD CALL GROUND CALL PANTRY & PASS. CALL LAMPS FAILURE	Check 'Call System' CB 265 on panel B.

COCKPIT VOICE RECORDER

POINTER DOES NOT REACH GREEN SECTOR ON TEST	Check 'Voice Recorder' AC & DC cb's 60 & 190 on panel B.

GPWS

NO RESPONSE ON TEST	Check 'GPWS' cb 483 on panel RB, 'GPWS' and 'Rad Alt' cb's 442 and 450 on panel RA.

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ABNORMAL HANDLING

ABANDONED TAKE-OFF

Either pilot may call 'Stop'.

Up to 100 kt - Abandon for any malfunction.

100 kt to V_1 - Abandon only for:

(a) Engine failure - Either thrust gauge reading falling below 80%.

(b) The Captain observing an emergency and calling 'Stop'.

Do not abandon for an engine fire or overheat warning, unless accompanied by a loss of thrust.

Complete the Abandoned Take-off drill:

1. Throttles - Both closed.
2. Speedbrake lever - Lift Dump.
3. Brakes - Apply full (or required) foot brake pressure immediately to ensure a stop in the available distance. If foot brakes malfunction, release the applied pressure, select anti-skid Off, and re-apply the brakes. If the brakes are still ineffective, apply the hand brake.
4. Throttles - Both to Reverse Idle.
   Operative engine(s) to Emergency Reverse.
   Cancel reverse thrust when a safe stop assured.
5. When the aircraft has slowed to taxy speed and a safe stop is assured, turn so that any possible source of fire is downwind of fuselage. Note that even very tight winds of 5 kts or less are expected to affect the subsequent spread of any fire.
6. When stopped - Captain (regain/keep control) - apply parking brake. Normal or Emergency drills as required - assess situation. Imminent Over-run/Pre Evacuation Drill if required.
7. If deceleration is not sufficient to ensure a stop on the runway and the aircraft is approaching rough ground or obstacles, carry out the Imminent Over-run Drill.
8. Brakes/Tyres inspection - Full inspection required before the next flight if a stop was initiated above 100 kt.

The scheduled Emergency Distances assume the use of Emergency Reverse thrust on one engine. Continuous maximum braking and Emerg Reverse may be required until the aircraft is stopped, to achieve a safe stop in an emergency distance limited take-off.

Maintain directional control by use of rudder, rudder fine steering, brakes, and then nosewheel steering; it may be necessary to reduce or temporarily cancel reverse thrust, to maintain directional control.

CONTINUED TAKE-OFF AFTER ENGINE MALFUNCTION

1. Throttles - Fully open at V_1, or immediately engine malfunctions if after V_1, and keep straight with rudder.
2. At V_R - Rotate to approximately 10° nose-up, to achieve V_2 at 35 ft.
3. Positive Climb - Select undercarriage Up.
4. Drills - Complete the memory items of the appropriate emergency drill (Engine Fire or Engine Shutdown & Overheat).
5. Climb at V_2, max bank angle 15° to H_a.
6. If malfunction occurs above V_2 or without power loss, maintain achieved speed up to V_2 + 20 kt max. If flap 8° speed or greater has been achieved, at a minimum of 300 ft QFE, select 8° flap (18° flap T/O.).
7. At H_a - (a) Accelerate in level flight to V_{FU}.
   (b) At flap 8° speed select 8° flap (18° flap T/O).
   (c) At flap 0° speed select 0° flap.
   (d) At V_{FU} set Max Continuous power.
   (e) Climb at V_{FU} max bank angle 15° to MSA.
   This 15° bank angle restriction is specified to maximise climb performance.
8. At 1500 ft QFE:

(a) Master valves	Open.
(b) Air delivery and crossfeed	Closed.
(c) Airframe anticing (from operative engine)	As required.

9. Drills - (a) Complete the After Take-off drill.
   (b) Check completion of the emergency drill.
   (c) Complete the After Engine Shutdown drill.

9. Air Systems - (a) No Ice - Master valves remain at APU.

(b) Icing - At 1,500 ft QFE:

Master valves - Close.
Air Crossfeed valve - Close.
Air Delivery valve - Close.
Wing and tail anticing - operative engine On.

10. At Min Safe Altitude, either:

(a) Increase to 170 kt, select 18° flap, and make a visual circuit or instrument approach return.

or (b) Increase to 210 kt and hold.

or (c) Increase to the Route SEC (single-engine climb) speed, and climb to cruise level subject to engine-out ceiling. Cruise at Max Continuous power, subject to V_{MO} or Rough Air speed limitations.

11. Air Systems - At the Min Safe Altitude:

With APU U/S and no ice -

(a) Set cabin altitude to aircraft altitude.

(b) Master valves - Open.

(c) Air Crossfeed valve - Open.

(d) Cabin selector - as required.

With ice -

(a) Set cabin altitude to aircraft altitude.

(b) Master valves - operative engine Open.

(c) Air Crossfeed valve - Close.

(d) Cabin selector - as required.

12. Complete the After 3,000 ft drill.

Engine anticing will be switched On immediately any ice warning is received, irrespective of height.

In certain conditions of low temperature, maximum continuous power is P3 limited, therefore 12,500 rpm or 560° TGT may not always be obtained.

The non-handling pilot will carefully monitor all flying, calling attention to any discrepancy by the use of the standard calls 'Height', 'Speed', 'Attitude', 'Configuration'.

ENGINE FAILURE DURING EN-ROUTE CLIMB, CRUISE, OR INITIAL DESCENT

1. Power - Max Continuous, unless in descent.

2. Drills - Complete the appropriate emergency drill, Engine Fire or Engine Shutdown and Overheat, After Engine Shutdown drill.

3. Speed - Route SEC speed, if highest possible ceiling or minimum descent gradient required, or appropriate Rough Air speed in turbulence, or maximum obtainable subject to V_{MO}/M_{MO} limitation.

4. Planning - Arrange a landing as soon as practicable. If an engine failure occurs before initiating descent from cruise level, subsequent flight must be planned to an airfield forecasting Cat 1 AOM or better, provided asymmetric flight in excess of 1 hour is not required.

For engine-out ceiling and drift-down information - see Handling Limitations chapter.

The cruise fuel consumption per air nautical mile flown is similar to that achieved on two engines.

The control forces required to keep the aircraft straight are generally small, but the aircraft must be accurately trimmed to achieve optimum performance. Misuse of the rudder will increase drag.

ASYMMETRIC APPROACH AND LANDING

Pre-Descent

1. Extract the 26° flap V_{AT}; set both inner ASI indices to the V_{AT}, and both outer indices to V_{AT} + 10 kt.
2. Plan an automatic ILS approach where possible.
3. A Cat 2 approach may be made only if an engine fails after leaving cruise level, otherwise plan a Cat 1 approach.
4. Autopilot - Disengage, retrim the aircraft, and re-engage.
5. A Prime Land approach may be made, but an asymmetric autoland is not permitted.
6. Autothrottle may be used, but if manual throttle is used - move both throttles together to avoid sounding the warning horn unnecessarily.

Descent

1. Maintain 38 psi mains air pressure.
2. Speed - As required, Rough Air speed in turbulence.

Holding

1. Configuration - Undercarriage Up, o° flap.
2. Speed - 210 kt, Rough Air speed in turbulence.

Intermediate Approach

1. Select 18° flap, leave undercarriage up.
2. Speed - 170 kt.
3. Maintain 38 psi mains air pressure, for adequate anticing and pressurisation.

Final Approach

Instrument Approach:

1. Undercarriage - Down on GP capture (or leaving 3,000 ft QFE on non-precision approach or turning inbound).
2. Speed - Maintain 170 kt until undercarriage locked down, then reduce to 160 kt.
3. Flaps - To 26° passing 2,000 ft QFE on GP (or approaching final beacon/marker on non-precision approach).
4. Rudder trim - Set 3° in the direction of the live engine.
5. Speed - Reduce to V_{AT} (26° flap) + 10 kt.
6. At 1,500 ft QFE - select airframe anticing Off.
7. Autopilot - Disengage by 50 ft ARTE.

Visual Approach:

1. Downwind - Undercarriage Down.
2. Speed - Maintain 160 kt.
3. Base leg - Select 26° flap, reduce to V_{AT} (26° flap) + 10 kt.
4. Establish on finals at approximately 800 ft QFE, minimum 600 ft QFE.
5. Power - as required for stable approach.

Landing

1. Autopilot - Disconnect by minimum disengage height.
2. Speed - Maintain V_{AT} (26° flap) + 10 kt to the threshold; if speed exceeds V_{AT} (26° flap) + 10 kt - consider an overshoot.

3. After Touchdown - Select Normal Reverse thrust if required.
   If the runway length is less than 1750m use Emerg Reverse thrust.
   If the runway is slippery, use Emerg Reverse thrust, and reduce or cancel reverse if directional control difficulties arise.

4. Systems Management - If No. 1 engine failed - leave Aux pump 1 On while taxying to the ramp.

Overshoot

1. Full power.

2. Rotate smoothly to 10° nose-up, selecting 18° flap.

3. When 18° flap achieved - select undercarriage Up.

4. Speed - V_{AT} (26° flap) minimum, V_{AT} (26° flap) + 20 kt maximum.

5. Maximum bank angle 15° until accelerating through V_{AT} (26° flap) + 30 kt.

6. If speed stabilised at or above V_{AT} (26° flap) + 10 kt, select 8° flap (not below 300 ft QFE).

7. Clear of obstacles (minimum 1,500 ft QFE in IMC) - accelerate in level flight to V_{AT} (26° flap) + 30 kt:

   At V_{AT} (26° flap) + 10 kt select 8° flap.

   At V_{AT} (26° flap) + 30 kt select 0° flap, apply Max Continuous power.

Use the rudder with precision, to reduce drag to a minimum and improve rate of climb.

ENGINE FAILURE DURING FINAL APPROACH (45° flap selected)

MAKE AN IMMEDIATE ASSESSMENT OF THE QUALITY OF THE APPROACH. IF IN DOUBT - OVERSHOOT, and reposition for an approach with 26° flap, automatic if possible.

If The Approach Is Continued

1. Apply sufficient power to maintain V_{AT} + 10 kt and the approach path.

/Cont'd. ...

2. Master valves - both to APU (if above 200 ft QFE).

3. Rudder trim - Set 6° (automatic approach).
   Set as required (manual approach).

Carefully check the direction in which rudder trim is applied; if it becomes physically difficult to apply, check that it is being applied in the correct sense.

The autopilot will not normally disconnect under these circumstances, but be prepared for this to happen. Autopilot and autothrottle may remain engaged to 50 ft ARTE, but an asymmetric autoland is not permitted. Be prepared for application of rudder on autopilot disconnect.

Raising the flaps from 45° to 26° following engine failure at V_{AT} + 10 kt produces a disturbing effect upon the aircraft flight path which cannot be quickly countered, and this procedure is not recommended.

ENGINE FAILURE DURING NORMAL OVERSHOOT

1. Full power.

2. Rotate smoothly to approximately 10° nose-up, selecting 18° flap.

3. When 18° flap achieved - select undercarriage Up.

4. Speed - V_{AT} + 10 kt minimum, V_{AT} + 30 kt maximum.

5. If speed stabilised at or above V_{AT} + 20 kt, select 8° flap (not below 300 ft QFE).

6. Clear of obstacles (minimum 1,500 ft QFE in IMC) - accelerate in level flight to V_{AT} + 40 kt:

   At V_{AT} + 20 kt select 8° flap.

   At V_{AT} + 40 kt select 0° flap, apply Max Continuous power.

   Restrict the bank angle to 15°, until accelerating through V_{AT} + 40kt.

Use the rudder with precision, to reduce drag to a minimum and improve rate of climb.

IN-FLIGHT MANUAL REVERSION

Immediate Actions

1. Hydraulic Cut-Off levers - Both Off.

2. Remove out of trim elevator force with the Elevator Trim selector switches.

3. Maximum speed for the rest of the flight - lesser of 270 kt/M_{IND} 0.72.

Manual reversion may result from a total loss of hydraulic power, flying control system failures requiring the closure of both hydraulic cut-off levers, or a combination of hydraulic system failure and flying controls failure. A pitch up (at high speed) or pitch down (at low speed) may occur on reversion.

Elevator control is heavy, with little self-centring, aircraft response to control is delayed and control inputs must be made in anticipation of delayed aircraft response. Make the maximum use of attitude references, flying attitude either visually or by the attitude director. Use the electric elevator trimming with caution, to avoid over correction. Autothrottle should not be used in manual elevator.

Rudder control is very heavy, with a limited range of movement available. Avoid steep bank angles, as the limited rudder authority can result in considerable sideslip and height loss, particularly at low airspeed. The loss of spoilers will degrade roll control, but control remains adequate.

The maximum crosswind component for landing is 10 kt, dry runway.

If the balance chart shows a CG position near the fwd or aft limits, move passengers if possible to obtain a mid-position CG whilst remaining inside the seating limitations.

Emergency Elevator

This system may be used at any time after manual reversion, but only at constant speed; it must not be engaged whilst a stick force is being applied. Above 180 kt IAS, the simulated feel will be lighter than in normal flight, and caution must be exercised to avoid overstressing the aircraft.

DO NOT USE THE ELEVATOR TRIM TAB WHEN EMERGENCY ELEVATOR IS ENGAGED - it has no effect on the emergency elevator system, and will result in the aircraft being out of trim when the system is disengaged.

Speed/Configuration Change with Emergency Elevator Engaged:

1. Emerg Elevator selector switch - Off.
2. Change speed and/or configuration as required.
3. Retrim the aircraft in manual reversion, using the elevator trim switches.
4. Re-engage the Emergency Elevator system.

This procedure will ensure that the aircraft will be in trim upon subsequent reversion to manual elevator control.

Descent

1. Set both inner ASI indices to the appropriate flapless or partial flap V_{AT}, and both outer indices to this V_{AT} + 10 kt. Amend the appropriate servo Decision Height by the addition of 40 ft, and set on the servo altimeter bug.
2. Determine which hydraulic services will still function:
   - (a) No. 1 system pressure available, cut-off lever Off. Lift dump, undercarriage, steering, stbd W/S wipers, will operate normally.
   - (b) No. 2 system pressure available, cut-off lever Off. Foot and hand braking, port W/S wiper, will operate normally.
3. Determine which standby systems are necessary:
   - (a) No. 1 system inoperative. Undercarriage must be lowered by free fall, standby steering must be selected On when the undercarriage is locked down.

(b) No. 2 system inoperative. Only stored brake pressure, sufficient for one normal landing (foot brake) and six hand brake application. If still available, the DC pump for lowering flaps to 18°, and subsequent topping-up of brake accumulator pressure and operation of the port W/S wiper.

4. Lower available emergency flap in sufficient time (18° flap using DC pump takes approximately 4 minutes), max speed 180 kt.
5. Use free fall undercarriage lowering if required. After free fall select standby steering on when the undercarriage is locked down.
6. DC pump - Off when 18° flap achieved.
7. Trip GPWS, CB483, panel RB.
8. Max crosswind component - 10 kt, dry runway only.

Approach and Landing

1. Intermediate approach speed - V_{AT} + 20 kt.
2. Establish a long straight-in approach at V_{AT} + 10 kt.
3. Engage Emergency Elevator, if available, when 18° flap is achieved and the undercarriage lowered.
4. Close the throttles at flare height, and fly the aircraft onto the runway with minimum hold-off.
5. At touchdown, hold the control column forward, select lift dump then Emergency Reverse thrust and braking - maintain until a safe stop is assured.

Notes

If manual reversion occurred at high speed, a considerable amount of nose-up elevator will be required on the approach; this will demand a substantial pull force if Emergency Elevator is engaged. The additional forces during the flare are not excessive. Care must be taken not to over-control during the flare, as a result of the heavy forces and poor centring in manual elevator. Before selecting reverse thrust, hold the control column well forward.

Maintain directional control with the very limited rudder available, assisted by differential braking and nosewheel steering; the number of brake and/or steering applications available may be limited, stored hydraulic pressure only if hydraulic system pressure lost.

If steering and or brakes are limiting, or the undercarriage doors are open (following free-fall lowering), restrict subsequent taxying to the minimum, i.e. just clear the runway; the undercarriage doors will normally drag only on a rough surface.

The DC pump, if available, may be used for limited periods to top-up the brake accumulators, or to operate the port windscreen wiper if necessary.

The landing distances quoted on Handling Limitations (h) should be adjusted by the amount appropriate to the flap setting achieved for final approach, and for lift dump/spoilers inoperative if applicable.

Overshoot

Do not attempt an overshoot, unless there is some critical, overriding, consideration making an overshoot imperative.

1. Full power.

2. Maintain V_{AT} + 10 kt to H_a, pitch attitude not to exceed 20°.

3. Select undercarriage Up if available.

4. Maintain Emergency Elevator, if engaged.

5. At or above H_a - reduce power to Normal Climb power.

6. Emergency Elevator - Disengage.

7. Speed - Increase to V_{AT} + 30 kt.

8. Climb to Safety Height.

Diversion After Overshoot:

1. Speed en-route - 160 kt IAS with undercarriage Down,
   220 kt IAS if undercarriage Up.
2. Retrim the aircraft.
3. Emergency Elevator - Engage, provided residual stick force tolerable.
4. The fuel consumption with undercarriage down and doors open, and 18° flap, will be about 2,600 kg/hr, 16 kg/air nm.

FLAPLESS OR REDUCED FLAP APPROACH AND LANDING

Initial Approach

1. An automatic approach must not be attempted with less than 26° flap achieved, autothrottle may be used.
2. Extract the appropriate flapless or partial flap V_{AT}; set both inner ASI indices to the V_{AT}, and both outer indices to V_{AT} or V_{AT} + 5 kt if turbulence is expected. If the achieved flap setting is 18° or less, amend the appropriate Servo Decision Height by the addition of 40 ft, and set on the servo altimeter bug.
3. Maintain V_{AT} + 20 kt, undercarriage Up or Down as required.
4. Note that the Final Approach speed may be higher than the speed at which the undercarriage warning will sound.
5. Trip GPWS, CB483, panel RB if landing with less than 26° flap selected.

Final Approach

1. Leaving 3,000 ft QFE or joining the glidepath - Undercarriage Down, maintain V_{AT} + 20 kt.
2. When established on glideslope (or non-precision, when on final heading) - Reduce to V_{AT} (V_{AT} + 5 kt in turbulence.)

Visual Circuit:

1. Downwind - Maintain V_{AT} + 20 kt.

2. Undercarriage - Down. Extend downwind leg 70 seconds beyond abeam touchdown.

3. Complete final turn at approximately 800 ft QFE, then reduce to V_{AT} (V_{AT} + 5 kt in turbulence).

4. Establish a longer and slightly shallower than normal approach, but on no account continue in VASI double red sector. Full use should be made of ILS G/P and VASI where available.

Landing

1. Automatic approach (26° flap) - The autopilot must be disengaged by 50 ft ARTE.

2. Avoid a lengthy hold-off, and achieve an early, positive touchdown.

3. Hold the control column forward, select lift dump, and Emergency Reverse, braking until a safe stop is assured.

The landing distances quoted on Handling Limitations (h) should be increased by the amount appropriate to the achieved flap setting.

Overshoot

1. Disengage autopilot and autothrottle, if engaged.

2. Apply full power.

3. Establish the initial climb attitude - this may be more nose-up than normal.

4. If the flaps are operable and extended beyond 18° - select 18° flap.

5. Undercarriage - Up.

6. Speed - accelerate to V_{AT} + 20 kt, reduce to Climb power.

7. Do not commence a turn before achieving V_{AT} + 20 kt.

MACH TRIM FAILURE

Fly with the autopilot engaged, and the procedures remain the same as for normal flight. In manual flight, reduce speed to a maximum of 0.72 M_{IND} if applicable. Normal holding, approach and landing procedures will be used.

LANDING PROCEDURES FOLLOWING SYSTEM FAILURES

Landing - Reverse Thrust Inoperative

With Reverse Thrust inoperative on both engines, the normal landing distance will be increased by approx 100 metres provided braking action is satisfactory. If the runway is slippery or with total brake failure, the absence of reverse thrust could well double, or in extreme cases treble the basic landing distance.

Landing - Spoilers and Lift Dumpers Inoperative

With all spoilers and lift dumpers inoperative, the normal landing distance at max landing weight on a wet runway will be increased by approx 150 metres. With lift dump only inoperative, the increase will be 70 metres.

With spoilers inoperative, the Crosswind Limitations for landing are reduced according to the number of pairs that are inoperative. See Drills, charts 2. Roll Rates are reduced, but Aileron Control remains adequate.

Landing - Complete Brake Failure

Speed should be reduced from V_{AT} + 10 to V_{AT} at the threshold. Select lift dump and Emergency Reverse Thrust as the mainwheels touch and maintain until the aircraft has stopped. At maximum landing weight the landing distance will be increased by approximately 500 metres.

Landing After Tailplane Trim Failure

Even in the most adverse conditions of TPI failed at cruise setting with the CG on the forward limit, sufficient elevator power is available to flare and land the aircraft, though full elevator deflection may be needed during the manoeuvre. At normal CG positions, the control column problem will be greatly eased. Even in the most adverse case, the maximum stick force required during the flare should not be greater than about 50 lb.

Undercarriage Emergencies

See: Hydraulic Services for emergency lowering.
Crash & Survival, page 1.
Crash & Survival, Emergency Landing and Evacuation.

FLIGHT WITH U/C EXTENDED

Ferry flights with the U/C extended are not permitted. If the U/C fails to retract after take-off, and an immediate return is impracticable, the following points must be considered, and if necessary a diversion should be made to the nearest suitable airfield.

1. Climb, cruise and descend at 200 kt IAS for best range. At this reduced speed the sector and diversion fuel used will be almost double the normal quantities. A working figure of 1500 kg fuel burn off per 100 air nm may be assumed.

2. Fuel consumption when holding at 210 kt with flap retracted will be approximately 2800 kg per hour.

3. If icing conditions are encountered and ice builds up on the wheels and undercarriage legs, there is a risk that the hydraulic pipe lines to the brakes may be damaged at touchdown.

4. In the event of an engine failure en route the net ceiling will be about 13, 000 ft lower than that scheduled for the clean aircraft. (See Handling Limitations, Ops Manual Vol. I).

FLIGHT WITH TOTAL ASI FAILURE

The following table is offered as a guide to pitch attitudes/power settings following total loss of ASIs. They have been calculated for one condition only, 39,000 kg in ISA, but the given combinations of attitude and configuration will be safe at lower weights.

Condition	Configuration Flap	Configuration U/C	Pitch Att. (approx)	IAS kt (approx)	RPM (approx)	ROD ft/min (approx)
Cruise	0	Up	+ 1½	300	11,075	0
Descent	0	Up	- 2	300	Flight Idle	FL200-2,450 FL100-2,240 SL -2,040
Approach - 2,000 ft level	0	Up	+ 6	210	10,400	0
	18	Down	+ 4	170	10,800	0
Glide-path	26	Down	0	160	10,300	850
	45	Down	0	V_{AT}+10	10,800	725

PILOT IN-FLIGHT INCAPACITY

Incapacitation in any crew member may not be immediately apparent. Sudden or progressive incapacitation should be suspected if either pilot begins to deviate from normal procedure, makes exaggerated responses to flight path disturbances or changes, fails to maintain assigned height or heading, whose speech becomes slurred, or fails to respond to a question, drill item, or R/T call. If in doubt, question him and observe his response; and, if incapacitation has occurred, act before the situation becomes operationally critical.

In the event of either Pilot becoming incapacitated, the other Pilot will immediately:

1. Take over control of aircraft, preferably on automatics, and adjust power for safe flight.
2. If on instrument approach, overshoot to a safe height whilst replanning course of action to be taken, e.g. diversion, use of ILS runway instead of beacon or radar approach or landing on a runway more into wind than the original.
3. Secure the incapacitated Pilot in his full seat harness, with Cabin Staff assistance if necessary, and lock the seat in the rearward position.
4. Inform ATC
    1. Intentions.
    2. Nature and degree of incapacity of other Pilot.
5. Control the aircraft from his own seat for the remainder of the flight.
6. Under no circumstances is a Pilot below the rank of Captain to attempt to control the aircraft from the unfamiliar Captain's seat.

When a safe flight condition has been established, recruit medical aid from a qualified passenger (doctor or nurse) or member of Cabin Staff. Consider seeking the assistance of any qualified flight crew member who may be travelling as a passenger.

STALLING AND RECOVERY ACTION

Intentional stalling is prohibited, except during authorised test flying and crew training - see Flight Handling Chapter, Vol 1, Technical.

Recovery From Stick-shake

1. Disconnect the autopilot and autothrottle.
2. Level the wings, lower the nose, and apply sufficient power to establish increasing airspeed and minimise the height loss - full power may be required at low altitude.
3. Check the configuration, and if necessary - Rectify. Restore the speed to a safe value.

If the stick-shake was of brief duration, it is possible that it was caused by a high rate of change of incidence, induced by turbulence or harsh elevator input or a combination of both. Check that the speed is not falling, and eliminate any excess 'G'.

Recovery From Stick-push

1. Never treat a stick-push as spurious, unless absolutely certain that the airspeed is consistent with safe flight in the existing aircraft configuration.
2. Disconnect the autopilot and autothrottle.
3. Push the control column fully forward.
4. Apply full power.
5. Prevent wing drop with use of aileron, not rudder.
6. Check the configuration, and if necessary - Rectify.
7. Recover from the resulting dive.

NEVER PULL THE STALL RECOVERY DUMP HANDLE, UNLESS CERTAIN THAT THE AIRSPEED IS CONSISTENT WITH SAFE FLIGHT.

Attitude alone is not a sufficient indication of recovery from a stalled or post-stall condition; positive, rapid, increase of airspeed is the only reliable indication of recovery.

When the stick-push cancels itself, maintain sufficient forward pressure on the control column to avoid further stick-shake operation and to ensure a rapidly-increasing airspeed; this technique should be modified only if severely constrained by the height available - in this case stick-shake and perhaps a second stick-push must be expected. If the stick-push has operated with the autopilot engaged, the tailplane will require re-trimming as speed increases during the recovery.

When the airspeed has increased by some 30 or 40 kt, ease out of the dive, preventing the control column from riding back too quickly, and re-establish normal flight. Retrim the aircraft to maintain a safe speed. Care may be needed in flying the recovery manoeuvre, to avoid exceeding the design limits of airspeed and manoeuvre loading.

Should a Super-Stall develop, characterised by a high rate of descent and rapidly-falling airspeed, but not necessarily a high pitch attitude, safe flight may be regained by using the above technique. However, in a super-stall, the angle of descent becomes very steep (in excess of 60°); to unstall the wings requires a corresponding, extremely steep, nose-down attitude to achieve the desired rapidly-increasing airspeed which will show that recovery from the dive can be initiated. A Super-Stall will not develop, provided the stick-push system is operative; failure of the system to operate when required is extremely improbable.

GPWS "PULL UP" WARNING

Full power________________Set.
Attitude and speed________Establish max rate climb.

Immediately rotate the aircraft to the overshoot attitude, establish positive rate of climb.

Flaps_____________________Select 18°, if at 26° or 45°,

If the flaps are extended, maintain speed. If the flaps are at 0°, trade airspeed for height to a minimum IAS of 210 kt.

U/C______________________ Select Up.

When the warning ceases, check the raio altimeter, pressure altimeter settings, aircraft position and Minimum Safe Altitude.

GPWS "GLIDESLOPE" WARNING

Apply power to regain the glidepath.

CRASH AND SURVIVAL

IN-FLIGHT EMERGENCIES

In the event of any emergency situation arising in flight, the cabin crew member designated in command of the cabin crew (SCCM) will be responsible to the Captain for:

1. Maintaining communications between the cabin and flight deck.
2. Receiving the Captain's instructions and briefing the cabin crew.
3. Initiation of emergency procedures as required, and correct execution.
4. Passenger safety and welfare.

When the Captain needs to call SCCM to the flight deck for an emergency briefing, he will simultaneously press the crew call button and make a standard passenger address announcement - 'Will the senior cabin crew member report to the flight deck immediately.'

In any emergency situation, Cabin Crew should start an emergency procedure only after an order from the Captain. However, in cases which are clearly catastrophic individual crew members should be prepared to act immediately on their own initiative.

The need for good communication between crew members is emphasised particularly when an evacuation plan as briefed by the Captain is subsequently changed by him.

Emergency announcements are contained in the Cabin Crew Safety Equipment and Procedures Manual.

Unusual Noises, Vibration, Smoke without Fire

If any such unusual conditions are observed, the Captain should be informed immediately; if this happens during an Abandoned Take-off, Landing, or during ground operations, an emergency evacuation must not be initiated without the Captain's instructions unless there is an obvious major fire situation, and the SCCM will report to the flight deck immediately.

TYPES OF EMERGENCY LANDING/DITCHING

There are two main forms of Emergency Landing/Ditching.

PLANNED -	Those that take place without warning.
PRE-PLANNED -	Those where there is ample warning to pre-plan the landing and evacuation.

UNPLANNED EMERGENCY LANDING/DITCHING AND EVACUATION

This can arise during or immediately after take-off or immediately prior to or after landing. It is the most critical case, and a successful evacuation will depend entirely upon the competence and initiative of the crew.

In these circumstances there may not be time to carry out the full pre-planned procedures and the following should be applied.

a) On a rejected take-off or after landing the Captain will initiate any required action, including evacuation.

b) With an immediate landing imminent, the Captain should call over the P.A. - "CAPTAIN TO SENIOR CABIN CREW MEMBER - THIS IS AN EMERGENCY - PREPARE FOR IMMEDIATE LANDING".

The Senior Cabin Crew Member should then say over the P.A. - "ATTENTION. WE ARE MAKING AN IMMEDIATE LANDING. PUT YOUR HEAD ON YOUR KNEES AND STAY THERE UNTIL THE AIRCRAFT STOPS".

All crew should remain in their take-off or landing positions.

PRE-PLANNED LANDING/DITCHING AND EVACUATION

Action will be initiated by the Captain calling over the PA "WILL THE SENIOR CABIN CREW MEMBER REPORT TO THE FLIGHT DECK IMMEDIATELY".

This is the "ALERT" signal and will be used only in an emergency, thus producing an immediate response from the SCCM and enabling the remaining crew to disengage "quietly" from their cabin service duties and go to their designated alert stations for briefing.

On arrival on the flight deck the SCCM will be briefed by the Captain on the nature of the emergency and of the time available before landing. With short time to landing, the Emergency Landing/Ditching Announcement must be made. If there is sufficient time available, the Pre-Recorded Announcement should be used.

At approximately 1,000 feet the Co-pilot will call "CABIN CREW TAKE YOUR SEATS FOR LANDING" and at 200 feet the Co-pilot will call "BRACE BRACE".

If the PA is unserviceable, the Captain and SCCM will agree a signal to be used for the "CABIN CREW TAKE YOUR SEATS FOR LANDING" and "BRACE BRACE" calls. This will probably be by using the crew call or by cycling the cabin signs OFF/ON.

EVACUATION

The Captain, or in his absence the next most senior crew member, will order an evacuation by use of the P.A. or where available the Evacuation Alarm. If conditions so require he may indicate on the P.A. the exits to be used. The operation of an Evacuation Alarm indicates an immediate evacuation order, but crew members at individual doors should always assess the situation outside before opening the door.

Only in cases which are clearly catastrophic should individual crew members be prepared to act immediately on their own initiative.

EMERGENCY LANDING

Although it is not BA policy to operate to airfields where fire and crash facilities are not available the urgency of the situation may dictate otherwise.

Should a landing on grass, earth or sand be inevitable:

a) landing run should not cross taxyways, ditches, hedges, etc.
b) ground should be reasonably smooth and free from rocks.
c) the area should not be soft or muddy.

If uphill, maintain high enough approach speed to ensure adequate pitch control.

Undercarriage Emergencies

BA policy is not to use foam for aircraft making emergency landing with undercarriage defects.

A runway or other paved surface is preferable to grass or sand for landing in all cases of undercarriage emergency, including belly landing.

If one or more legs fail to lock down, the landing should be made with all available undercarriage extended, unless the airfield has special characteristics which make the consequences of leaving the side of the runway extremely serious; in this case diversion to a more suitable airfield is preferable to a belly landing.

Do not attempt to lock an undercarriage leg by brushing or bouncing on the runway.

Prior to Approach:

Co-ordinate with all ground emergency facilities. For example the fire trucks normally operate on a common VHF frequency with the airplane and can advise the crew of airplane condition during landing.

Brief SCCM

"Will the SCCM report to the Flight Deck immediately"
Nature of emergency
Captain's intentions
Time available
Captain or cabin crew to make announcement
Other information

DITCHING

The recommended procedure of a shallow approach followed by a flare is intended to produce the most favourable conditions for survival on impact with the water. The conditions are the minimum rate of descent and a pitch attitude of 8° nose-up; small angles of roll or yaw up to about 10° can be tolerated. An attitude of less than 7° nose-up will produce excessive deceleration on impact, while more than 11° nose-up will result in violent nose-down pitching, with a possibility of fuselage failure. If the flight director is available, its pitch control should be set to 8° pitch-up to assist in attaining the correct attitude. The flags may appear on setting, but will disappear on rotating to the desired attitude.

If the aircraft should bounce on impact, the 8° nose-up attitude should be maintained, rather than holding the control column fully back. For comparison, the normal pitch attitude at touch-down on a runway is only 2° nose-up.

EVACUATION PROCEDURES

GENERAL

Crowd Control

Crowd control is an essential part of any emergency situation. It is essential that passengers are quickly and positively directed towards the nearest usable exits.

The control of passenger movement begins when they have been instructed to undo their seat belts and move to their nearest exit.

The instructions given to passengers as they reach an exit must be phrased in a POSITIVE manner.

NOTE: A megaphone may be used to assist in crowd control.

Actions

Once the aircraft has come to a complete stop open only exits not affected by fire or other hazard.

Direct passengers through available doors, by standing to the side of the doorway so that none of the available exit area is blocked. Maintain a firm hold of any convenient part of the aircraft. Use the Assist handle where fitted.

Use whatever physical force is necessary to keep the passengers moving.

At the slide:-

(a) (i) On hand held slides call "SIT AND SLIDE"

(b) When assisting passengers through the doorways, all physical contact should be kept below shoulder level preferably in the small of the back or even lower. If passengers sit down, do not bend down to them but use your foot or knee in their backs to tip them down on to the slide.

(c) Order the first able-bodied passengers to wait at the bottom of the slide to help others to their feet and away from the aircraft.

(d) At the overwing exits, call "SLIDE OFF THE REAR OF THE WING".

Check your cabin area is clear of passengers, then leave via the nearest available exit. When on the ground, assist with the marshalling of passengers away from the aircraft.

Actions After Evacuation

1. SCCM will take a head count when all passengers are grouped at a safe distance, note any injuries to passengers and crew, and report to the Captain or senior crew member.

2. Administer first aid as required.

3. No fire hazard - a crew member may re-enter the aircraft to collect essential items

4. Ensure all passengers remain grouped and well clear of aircraft.

5. Prevent unauthorised entry of the aircraft or removal of any pieces of wreckage, equipment, cargo and personal effects. Do not obstruct the Press from taking photographs.

6. Make no comments directly to the Press.

7. The Captain or senior crew member will ensure that a British Airways authority is notified.

8. Cabin crew members will be required to give a joint statement, individual statements when individual crew members cannot agree, covering that and any previous sectors flown in that aircraft as well as the details of the actual incident/accident.

Actions after Ditching

1. Evacuate through overwing emergency exits, assisting elderly passengers and children as necessary.

2. If possible, evacuate family groups together.

3. Instruct exiting passengers to inflate lifejackets.

4. Remain on wings for as long as possible .

5. If aircraft sinks, try to keep survivors together in a large group.

CRASH & SURVIVAL EQUIPMENT

Emergency Doors

The port entrance door and the service door should be used as emergency exits as the situation demands. If circumstances permit, the rear entrance door should also be used.

Emergency Windows

The flight deck DV windows can be used as emergency exits by opening them in the normal manner.

Two escape hatches are fitted on each side of the cabin above the wing, and can be opened from inside by using the PULL handle, then lifting the hatch and removing it inwards. When removed in an emergency, the hatches are to be turned sideways and ejected out of the cabin, forward if possible, away from the escape route on the wing. Each hatch can also be opened from the outside by tearing off the two hand-hole covers, then using the PUSH button at the top of the hatch, lifting it, and then placing it on the wing.

Escape Slides (Chutes)

Two escape slides are carried in a stowage in the forward vestibule roof. When a slide has been released from its stowage a PULL tab is exposed, which is attached to a pin in the centre of a telescopic bar. Removal of the pin allows the bar to extend, and it must then be engaged in the hooks at the bottom of the door surround to provide the lower anchorage for the slide.

Lifejackets

The lifejacket is completely self-righting and is held in position by tying its two tapes round the waist.

Initial inflation is brought about by pulling sharply the red knob on the CO_2 cylinder at the bottom of the jacket. Subsequent topping-up is done through a mouth inflation tube, equipped with a non-return valve. Inflation should be delayed until after leaving the aircraft.

The jacket can be deflated by carefully inserting into the mouthpiece the plastic key which is provided.

The light on the shoulder operates automatically with immersion of the jacket. A Plastic whistle, deflation key and lanyard are attached at the side of the jacket.

/Cont'd. ...

Lifesaving Cots

Inflation of the cot should be done before ditching by a member of the cabin crew and not by the parent. If fitted, the 'Pull to Light' flap must be pulled. The cot should be lowered into water, NOT carried by someone jumping in.

Break-in Areas

Four break-in areas are marked on the top of the fuselage; one over the front of the cabin, one above the wing leading edge, one above the wing trailing edge, and one over the rear end of the cabin.

Megaphone

The megaphone is a portable unit, powered by internal batteries, with an integral handle incorporating the On/Off trigger; the microphone is mounted at the rear of the body, and a slide switch controls the volume at two pre-set values (up-Low, down-High).

The megaphone should be held with the microphone close to the mouth, and the trigger held in for the duration of the announcement. For announcements made within the aircraft cabin use the 'Low' position of the volume switch, outside the aircraft use the 'High' setting.

Escape Ropes

These are stowed in conduits mounted in the roof above the forward stbd door and above each flight deck side window and are withdrawn for use by using the tag marked 'Pull' on the end of each rope. The rope must be pulled out until a green band is exposed, indicating that it is fully extended, before use.

3. No fire hazard - a crew member may re-enter the aircraft to collect essential items.

4. Ensure all passengers remain grouped and well clear of aircraft.

5. Prevent unauthorised entry of the aircraft or removal of any pieces of wreckage, equipment, cargo and personal effects. Do not obstruct the Press from taking photographs.

6. Make no comments directly to the Press.

7. The Captain or senior crew member will ensure that a British Airways authority is notified.

8. Cabin crew members will be required to give a joint statement, individual statements when individual crew members cannot agree, covering that and any previous sectors flown in that aircraft as well as the details of the actual incident/accident.

Actions After Ditching

1. Evacuate through overwing emergency exits, able-bodied passengers assisting elderly and children.

2. If possible, evacuate family groups together.

3. Instruct exiting passengers to inflate lifejackets, link together with lifejacket lanyards.

4. When survivors are linked together in large group, well clear of aircraft, make head count.

SURVIVAL AFTER EMERGENCY LANDING

See Cabin Crew Operations Manual Vol. 1, Crash and Survival chapter.

Emergency Doors

The port entrance door and the service door should be used as emergency exits as the situation demands. If circumstances permit, the rear entrance door should also be used.

Emergency Windows

The flight deck DV windows can be used as emergency exits by opening them in the normal manner.

Two escape hatches are fitted on each side of the cabin above the wing, and can be opened from inside by using the PULL handle, then lifting the hatch and removing it inwards. Each hatch can also be opened from the outside by tearing off the two hand-hole covers, then using the PUSH button at the top of the hatch, lifting it, and removing it inwards.

Escape Slides (Chutes)

Two escape slides are carried in a stowage in the forward vesitbule roof. When a slide has been released from its stowage a PULL tab is exposed, which is attached to a pin in the centre of a telescopic bar. Removal of the pin allows the bar to extend, and it must then be engaged in the hooks at the bottom of the door surround to provide the lower anchorage for the slide.

Lifejackets

The lifejacket is completely self-righting and is held in position by tying its two tapes round the waist.

Initial inflation is brought about by pulling sharply the red knob on the CO_2 cyclinder at the bottom of the jacket. Subsequent topping-up is done through a mouth inflation tube, equipped with a non-return valve. Inflation should be delayed until after leaving the aircraft.

The jacket can be deflated by carefully inserting into the mouthpiece the plastic key which is provided.

/Cont'd. ...

The light on the shoulder operates automatically with immersion of the jacket. A plastic whistle, deflation key and lanyard are attached at the side of the jacket.

Lifesaving Cots

Inflation of the cot should be done before ditching by a member of the cabin crew and not by the parent. If fitted, the 'Pull to Light' flap must be pulled. The cot should be lowered into water, NOT carried by someone jumping in.

Break-in Areas

Four break-in areas are marked on the top of the fuselage; one over the front of the cabin, one above the wing leading edge, one above the wing trailing edge, and one over the rear end of the cabin.

Loudhailer

The loudhailer is a portable unit, powered by internal batteries, with an integral handle incorporating the On/Off trigger; the microphone is mounted at the rear of the body, and a slide switch controls the volume at two pre-set values (up-Low, down-High).

The loudhailer should be held with the microphone close to the mouth, and the trigger held in for the duration of the announcement. For announcements made within the aircraft cabin use the 'Low' position of the volume switch, outside the aircraft use the 'High' setting.

Escape Ropes

These are stowed in conduits mounted in the roof above the forward stbd door and above each flight deck side window and are withdrawn for use by using the tag marked 'Pull' on the end of each rope. The rope must be pulled out until a green band is exposed at the end of the conduit, indicating that it is fully extended, before use.

OPERATION WITH ONE INOPERATIVE EXIT OR ESCAPE SLIDE

Operation with one exit or escape slide inoperative is permitted provided that:

(a) the door associated with an unserviceable escape slide is treated as inoperative.

(b) the maximum number of passengers carried is as follows:

Inoperative exit	Max. no. of passengers
Ventral airstair or airstair door	No restriction
Port or starboard forward door	67
Port or starboard forward overwing exit	87
Port or starboard rear overwing exit	No restriction

(c) the inoperative exit is secured closed and is labelled 'No Exit'.

(d) 'Exit' or 'Emergency Exit' signs associated with the inoperative door and signs directing passengers to it are obscured.

(e) an announcement is made to the passengers before take-off and landing to draw their attention to the inoperative exit.

The 'No Exit' labels are stowed in the stowage behind the cabin crew seat head pad in the forward port bulkhead/stowage.

FIRE-FIGHTING EQUIPMENT

Asbestos gloves)
Smoke mask/portable oxygen)
Water/Glycol and CO_2 extinguisher)
See Crash & Survival 5 for location of equipment.

Use of Extinguishers

First use the type of extinguisher best suited to the type of fire and location; if the fire is not extinguished, and does not involve electrical equipment or inflammable liquids, use any available extinguisher, or attempt to contain the fire by smothering. Oxygen should be used when smoke or fumes are present, and must be used when discharging a CO_2 extinguisher - portable oxygen and smoke mask (from flight deck), crew mask if smoke mask cannot be obtained in time. Use the asbestos gloves (from flight deck) for additional protection.

The water-glycol extinguisher is intended for use on fires not involving electrical equipment, where the jet can be directed on the fire; the jet is electrically conductive, and if used on live electrical equipment could hazard the user and other electrical equipment. Water glycol must not be used on inflammable liquids, as the jet will simply spread the liquid over a greater area and not extinguish the flames. To operate, hold the extinguisher upright, press the lever, and direct the jet as close as possible to the base of the fire - the duration is approximately 15 seconds.

CO_2 extinguishers smother and cool fires, by forming a barrier of non-conductive, inert, gas at a very low temperature between the burning substances and free atmospheric oxygen, and are specifically intended for use against liquid and electrical fires; they are also effective in confined spaces against all types of fires, where a water jet could not reach the actual fire. Although CO_2 is non-toxic, high concentrations will cause incapacity, and oxygen must be used by the operator. To operate, aim the discharge horn at the base of the fire, remove the safety pin, keep the cylinder upright, and pull the trigger. The discharge horn can be pulled free from the swivel joint, for access to otherwise unaccessible areas. Cover the fire area progressively, with a side to side sweeping action, moving forward steadily. The duration is up to 25 seconds maximum.

FIRST AID

LIFE-SAVING MEASURES

Take any life-saving measures that are necessary:

1. ARREST OF BREATHING - Commence Exhaled Air Resuscitation (Kiss of Life) at once and continue if necessary for at least 1 hour.
2. SEVERE HAEMORRHAGE - Control bleeding as soon as possible.

METHOD OF CONTROLLING SEVERE EXTERNAL HAEMORRHAGE:

(i) Apply direct pressure over the wound
(ii) Elevate the limb.
(iii) Apply a very firm dressing to the wound.

If this method proves ineffective and severe bleeding continues, THEN ONLY should a tourniquet or rubber pressure bandage be applied and the following rules must be observed.

(a) Apply tourniquet between wound and heart so that it is tight enough to stop all bleeding.
(b) Release every 15-20 minutes for a few seconds and then re-apply.
(c) Attach label to patient or mark forehead giving time of application and time of each subsequent release.
(d) So that it can be easily seen, do not cover the tourniquet.

GENERAL CARE IN SEVERE CASES OF INJURY OR ILLNESS WHEN THE PATIENT IS CONSCIOUS

1. Obtain expert medical assistance as soon as possible.
2. Do not move the patient unless he is in some physical danger.
3. The patient should be lying down with lower limbs raised, provided this position is comfortable to him and his breathing is not unduly distressed.
4. Loosen tight clothing and give oxygen if required.
5. Keep him reasonably warm. Do not overheat.
6. Give sips of water, except for abdominal cases.

/Cont'd. ...

7. Reassure and calm the patient.
8. Reduce pain by: (a) Dressings to wounds. Immobilise injured parts using triangular bandages.
   (b) Use of drugs.

If pain is severe, Morphia 15 milligrams (grains $\frac{1}{4}$) may be given by the crew if medical aid cannot be obtained within half an hour.

Morphia is a Dangerous Drug and may only be used in the following cases:

(a) Severe visible bleeding.
(b) Severe pain due to injury, i.e. burns, fractures, etc.
(c) Severe pain due to Coronary Thrombosis.
(d) Severe pain due to Renal Colic.

It is forbidden to give Morphia in the following cases:

(a) Head injuries and unconscious patients.
(b) Children under 16 years of age.
(c) Expectant Mothers.
(d) Severe respiratory distress.
(e) Severe abdominal pain due to disease.

For method of administration follow instruction on Morphia container.

After injection has been made, complete label giving time and date of injection and attach to patients clothing or mark letter 'M' on forehead if no labels are available.

A second injection of Morphia must not be given within 6 hours.

BURNS

Burns are particularly susceptible to infection, so:-

1. Do not touch burn with bare hands or apply any ointment.
2. Cover whole area with sterile dry dressings as quickly as possible.
3. Then follow advice for 'General Care in Severe Cases of Injury'.

UNCONSCIOUSNESS

There are many causes for unconsciousness but, whether or not the cause is known, the following action should be taken to ensure the general welfare of the patient while in this state:

1. Check breathing, which is always at risk while the patient is unconscious, and give Exhaled Air Resuscitation if necessary.
2. If breathing is noisy, move to $\frac{3}{4}$ prone position (half-way between side and face down position) and turn the head to one side.
3. Clear the air passages of any saliva, vomit, dentures, blood, etc.
4. Loosen any tight clothing and keep reasonably warm.
5. Give nothing by mouth.
6. Never leave unattended - Breathing is always in danger.
7. Obtain medical assistance as soon as possible.

ELECTRIC SHOCK

1. Switch off power supply BEFORE touching victim. If unable to do so, attempt to move him away from source of electrical supply using insulated materials.
2. Breathing will have almost certainly stopped, so commence Exhaled Air Resuscitation.
3. Then follow advice for attending unconscious patients.

ILLNESS OR INJURY DURING FLIGHT

Cabin Crew Flight Report - Part 1 Medical, carried in the amenities case, provides for the accurate reporting of the symptoms and other particulars of a person injured or taken ill in flight.

The form outlines the action to be taken by the Captain and Air Cabin Crew in dealing with and reporting the occurrence and gives guidance on the recognition of infectious disease.

EYE CONTAMINATION BY SKYDROL

1. Obtain 'Steriflex' pack of Sodium Chloride Injection, stowed adjacent to first aid kit.
2. Bend and break the seal to release fluid.
3. Remove the cap from the nozzle.
4. Direct the fluid into the eye.
5. Continue to irrigate for 20 minutes.
6. If soreness persists, seek medical attention.

EMERGENCY LANDING & EVACUATION

CAPTAIN

Duties indicated in bold lettering

ON LAND

Basic Procedure

1. **Cabin address – 'Will the senior steward report to the flight deck immediately!'**
2. Maintain communications on Captain's instructions.
3. **Brief the CC i/c: Nature of emergency. Captain's intentions.**
   Time available. Other information.
   Captain or stewardess to make announcement.
4. **Complete descent and approach drills.**
5. **CC i/c's report. Confirm brace for impact signal.**

Impact

1. **Flight deck: Torch – Available.**
   Emergency lighting – On, Door – Split.
2. Crew call lamp – Give 'brace for impact' warning.
3. HP cocks – Shut on touchdown.
4. 3 fire control handles – Pull, first shot.
5. 3 generators – Trip.
6. Battery switch – Off.

Evacuation

1. **Evacuate from exits nearest ground, or away from fire.**
2. **Direct evacuation.**
3. 2nd Pilot, assist evacuation.
4. 3rd crew member, if carried, assist midships.

Undercarriage Emergencies

Use all available undercarriage unless runway has special characteristics, e.g. Gibraltar.

If one leg retracted or not locked down:

- Hold up wing on that side as long as possible by harsh use of aileron.
- Keep aircraft straight by full rudder, nosewheel steering and gentle braking.

If nosewheel up or not locked down:

- Brief the CC i/c: adjust load to give aft C of G, control passenger movement after touchdown.
- Land on main wheels and lower nose gently at about 85 kt.
- Use reverse thrust throughout landing run, and lift dumpers.
- Delay Impact drill items 4, 5, 6 until engines are no longer required.
- Use wheel brakes only to keep aircraft on runway.
- Do not attempt to force aircraft back onto tail.

If u/c suspect, do not move aircraft until ground locks are fitted.

If impact expected action 🟧 items.
If impact not expected action 🟦 items.

Where possible, establish direct RT contact with Airport Fire Service.

Fire and Overheat warnings should if necessary be confirmed by Fire Service external check before evacuation is ordered.

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EMERGENCY LANDING & EVACUATION

CAPTAIN

Duties indicated in bold lettering

DITCHING

1. **Make distress call –**

Mayday . . . Mayday . . . Mayday.
Call sign of station addressed.
Aircraft call sign.
Nature of distress.
Intention of Captain.
Present position, level, heading.

2. **If no reply to distress call or if no other transponder mode/code allocated set 77-00 mode A.**
3. **Cabin address – 'Will the senior steward report to the flight deck immediately!'**
4. Maintain communications.
5. **Brief the CC i/c: Nature of emergency. Captain's intentions.**
   Time available. Other information.
   Captain or Stewardess to make announcement.
   Crew call lamps out. Brace-for-impact signal.

6. Notices – On.
7. **Flight Deck:** Altimeters – Both to QNH. Set V_{AT}.
   Emergency lighting – On. Door – Split.
   Loosen neckwear, fit lifejacket. Torch – Available.
8. At FL100 or aircraft altitude if lower: Air isolation valves – Close. Master valve switches – Close.
   Ram air valve switch – Normal. Safety valve switch – Normal.
9. **Harness and seat locked. Doors and windows closed.**
10. **CC i/c's report. Confirm brace for impact signal.**

11. U/C – Up, trip horn CB.
    Depressurise completely by 2,000 ft, then Dump valve – Close.
    Speed brakes – In, flaps – 45°.
12. **Normal approach speed, 200 ft/min. R.O.D. if power available.**
13. Landing lamps – On at night.
14. **Wind below 25 kt: Ditch along swell as nearly into wind as possible, best point is on forward slope of oncoming swell.**
    Wind above 25 kt or light wind and no swell – ditch into wind.
    Make final approach and touchdown entirely on instruments. Flare to achieve 8° nose-up on impact, using radio altimeter to initiate, at 30 ft with power or 60 ft without power.
15. Brace for impact – press crew call lamp. APU fire handle – Pull.
16. **If aircraft bounces, maintain 8° nose-up.**

17. After impact, HP cocks – Shut.
18. **Direct evacuation, onto port wing if conditions permit.**
19. Second Pilot assist evacuation, onto stbd wing if conditions permit.
20. 3rd Crew Member assist evacuation where appropriate.
21. **If aircraft sinks, tie survivors to form circle (assists location).**

EMERGENCY LANDING & EVACUATIO

2nd PILOT

Duties indicated in bold lettering

ON LAND

Basic Procedure

1. Cabin address – 'Will the senior steward report to the flight deck immediately!'
2. **Maintain communications on Captain's instructions.**
3. Brief the CC i/c: Nature of emergency. Captain's Intentions.
   Time available. Other Information.
   Captain or stewardess to make announcement.
4. Complete descent and approach drills.
5. CC i/c's report. Confirm brace for impact signal.

Impact

1. **Flight deck: Emergency lighting – On. Torch – Available.**
   Door – Split.
2. **Crew call lamp – Give 'brace for impact' warning.**
3. **HP cocks – Shut on touchdown.**
4. **3 fire control handles – Pull, first shot.**
5. **3 Generators – Trip.**
6. **Battery switch – Off.**

Evacuation

1. **Evacuate from exits nearest ground, or away from fire.**
2. Captain, direct evacuation.
3. **Assist evacuation.**
4. 3rd crew member, if carried, assist midships.

Undercarriage Emergencies

Use all available undercarriage unless runway has special characteristics, e.g. Gibraltar.

If one leg retracted or not locked down:
- Hold up wing on that side as long as possible by harsh use of aileron.
- Keep aircraft straight by full rudder, nosewheel steering and gentle braking.

If nosewheel up or not locked down:
- Brief the CC i/c : adjust load to give aft C of G, control passenger movement after touchdown.
- Land on main wheels and lower nose gently at about 85 kt.
- Use reverse thrust throughout landing run, and lift dumpers.
- Delay Impact drill items 4, 5, 6 until engines are no longer required.
- Use wheel brakes only to keep aircraft on runway.
- Do not attempt to force aircraft back onto tail.

If u/c suspect, do not move aircraft until ground locks are fitted.

If impact expected action ▬ items.
If impact not expected action ▬ items.

Where possible, establish direct RT contact with Airport Fire Service.
Fire and Overheat warnings should if necessary be confirmed by Fire Service external check before evacuation is ordered.

2nd PILOT

Duties indicated in bold lettering

DITCHING

1. Make distress call –

> Mayday . . . Mayday . . . Mayday.
> Call sign of station addressed.
> Aircraft call sign.
> Nature of distress.
> Intention of Captain.
> Present position, level, heading.

2. If no reply to distress call or if no other transponder mode/code allocated set 77–00 mode A.
3. Cabin address – 'Will the senior steward report to the flight deck immediately!'
4. **Maintain communications.**
5. Brief the CC i/c:
   Nature of emergency. Captain's intentions.
   Time available. Other information.
   Captain or Stewardess to make announcement.
   Crew call lamps out. Brace-for-impact signal.

6. **Notices – On.**
7. **Flight deck: Altimeters – Both to QNH. Set V_{AT}.**
   Emergency lighting – On. Door – Split.
   Loosen neckwear, fit lifejacket. Torch – available.
8. **At FL 100 or aircraft altitude if lower: Air isolation valves – Close.**
   Master valve switches – Close.
   Ram air valve switch – Normal.
   Safety valve switch – Normal.
9. **Harness and seat locked, doors and windows closed.**
10. CC i/c's report. Confirm brace for impact signal.

11. **U/C – Up, trip horn CB.**
    Depressurise completely by 2,000 ft. then: Dump valve – Close.
    Speed brakes – In, flaps – 45°.
12. Normal approach speed, 200 ft/min. R.O.D. if power available.
13. **Landing lamps – On at night.**
14. Wind below 25 kt: ditch along swell as nearly into wind as possible, best point is on forward slope of oncoming swell.
    Wind above 25 kt or light wind and no swell – ditch into wind.
    Make final approach and touchdown entirely on instruments. Flare to achieve 8° nose-up on impact, using radio altimeter to initiate, at 30 ft with power or 60 ft without power.
15. **Brace for impact – press crew call lamp. APU fire handle – Pull.**
16. If aircraft bounces, maintain 8° nose-up.

17. **After impact. HP cocks – Shut.**
18. Captain direct evacuation, onto port wing if conditions permit.
19. **Assist evacuation, onto stbd wing if conditions permit.**
20. 3rd Crew Member assist evacuation where appropriate.
21. **If aircraft sinks, tie survivors to form circle (assists location).**

EMERGENCY LANDING & EVACUATION

3rd CREW MEMBER

Duties indicated
in bold lettering

ON LAND

Basic Procedure

1. Cabin address – 'Will the senior steward report to the flight deck immediately!'
2. Maintain communications on Captain's instructions.
3. Brief the CC i/c: Nature of emergency. Captain's intentions.
   Time available. Other information.
   Captain or stewardess to make announcement.
4. Complete descent and approach drills.
5. CC i/c's report. Confirm brace for impact signal.

Impact

1. **Flight deck: Torch – Available.**
   Emergency lighting – On. Door – Split.
2. Crew call lamp – Give 'brace for impact' warning.
3. HP cocks – Shut on touchdown.
4. 3 fire control handles – Pull, first shot.
5. 3 Generators – Trip.
6. Battery switch – Off.

Evacuation

1. **Evacuate from exits nearest ground, or away from fire.**
2. Captain, direct evacuation.
3. 2nd Pilot, assist evacuation.
4. **Assist midships.**

Undercarriage Emergencies

Use all available undercarriage unless runway has special characteristics, e.g. Gibraltar.

If one leg retracted or not locked down:
Hold up wing on that side as long as possible by harsh use of aileron.
Keep aircraft straight by full rudder, nosewheel steering and gentle braking.

If nosewheel up or not locked down:
Brief the CC i/c: adjust load to give aft C of G, control passenger movement after touchdown.
Land on main wheels and lower nose gently at about 85 kt.
Use reverse thrust throughout landing run, and lift dumpers.
Delay Impact drill items 4, 5, 6 until engines are no longer required.
Use wheel brakes only to keep aircraft on runway.
Do not attempt to force aircraft back onto tail.

If u/c suspect, do not move aircraft until ground locks are fitted.

If impact expected action 🟥 items.
If impact not expected action 🟦 items.

Where possible, establish direct RT contact with Airport Fire Service.
Fire and Overheat warnings should if necessary be confirmed by Fire Service external check before evacuation is ordered.

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EMERGENCY LANDING & EVACUATION

3rd CREW MEMBER

Duties indicated in bold lettering

DITCHING

1. Make distress call –

> Mayday . . . Mayday . . . Mayday.
> Call sign of station addressed.
> Aircraft call sign.
> Nature of distress.
> Intention of Captain.
> Present position, level, heading.

2. If no reply to distress call or if no other transponder mode/code allocated set 77–00 mode A.
3. Cabin address – 'Will the senior steward report to the flight deck immediately!'
4. Maintain communications.
5. Brief the CC i/c:
   Nature of emergency. Captain's intentions.
   Time available. Other information.
   Captain or Stewardess to make announcement.
   Crew call lamps out. Brace-for-impact signal.

6. Notices – On.
7. **Flight deck:** Altimeters – Both to QNH. Set V_{AT}.
   Emergency lighting – On. Door – Split.
   Loosen neckwear, fit lifejacket. Torch – Available.
8. At FL100 or aircraft altitude if lower: Air isolation valves – Close. Master valve switches – Close.
   Ram air valve switch – Normal. Safety valve switch – Normal.
9. **Harness and seat locked.**
   Doors and windows closed.
10. CC i/c's report. Confirm brace for impact signal.

11. U/C – Up, trip horn CB.
    Depressurise completely by 2,000 ft, then Dump valve – Close.
    Speed brakes – In, flaps – 45°
12. Normal approach speed, 200 ft/min. R.O.D. if power available.
13. Landing lamps – On at night.
14. Wind below 25 kt: ditch along swell as nearly into wind as possible, best point is on forward slope of oncoming swell.
    Wind above 25 kt or light wind and no swell – ditch into wind.
    Make final approach and touchdown entirely on instruments. Flare to achieve 8° nose-up on impact, using radio altimeter to initiate, at 30 ft with power or 60 ft without power.
15. Brace for impact – press crew call lamp. APU fire handle – Pull.
16. If aircraft bounces, maintain 8° nose-up.

17. After impact, HP cocks – Shut.
18. Captain direct evacuation, onto port wing if conditions permit.
19. Second Pilot assist evacuation, onto stbd wing if conditions permit.
20. **Assist evacuation where appropriate.**
21. **If aircraft sinks, tie survivors to form circle (assists location).**

SPECIFIC BOMB THREAT IN FLIGHT

SPECIFIC if: a. Received from a British Airways source, or –
b. Information received identifies a particular flight and states that a bomb is on board.

Basic Procedure

1. Declare Emergency – If no other transponder mode/code allocated, set 7700 mode A.
2. Divert to nearest suitable airfield.
3. Cabin address – "Will the Cabin Crew in charge report to the flight deck immediately."
4. Descend as soon as practicable to below FL100 – Depressurise at a height equal to or less than the max achieved cabin altitude.
5. Brief CC i/c: Bomb threat – passengers not to be told.
   Prepare for emergency evacuation.
   Search cabin, catering eqpt., toilets.
6. Cabin address – "A landing is to be made at . . . . . for operational reasons."

Before Landing

1. Confirm – Location of designated parking area.
   Whether steps available.
   Emergency evacuation procedures with CC i/c.

After Landing

1. Cabin address – "It is imperative to leave the aircraft without delay. Kindly follow the instructions given by the Cabin Crew."
2. Main engines – Shut down.
3. Lighting – All On, except landing lamps.
4. Direct evacuation, use slides if steps not available.
5. Assemble passengers well clear of aircraft (100 metres).

Suspicious Articles

1. Do not move or touch; but, if it is considered essential to move the article for the safety of the aircraft, handle gently and place on aisle seat, row 6, starboard side.
2. Move passengers as far away as possible – sitting with heads below level of seat backs.
3. Pack around with blankets and coats, wetting outer layer.
4. Advise Ground Authorities.

See Operations Manual Vol. 5, Section 5, for full information and procedures after evacuation. Accident reporting procedure – see Appendix 7, para 7.

SPECIFIC BOMB THREAT ON GROUND

SPECIFIC if: a. Received from a British Airways source, or –
b. Information received identifies a particular flight and states that a bomb is on board.

Basic Procedure

1. Alert ATC and Ground Engineer – Confirm parking area and whether steps available.
2. Cabin address – "Will the Cabin Crew in charge report to the flight deck immediately."
3. Brief CC i/c: Bomb threat – passengers not to be told.
   Evacuate on Captain's instructions (cabin address).
   Use entry doors, and slides if air jetty or steps not available.

Evacuation

1. Cabin address – "It is imperative to leave the aircraft without delay. Kindly follow the instructions given by the Cabin Crew."
2. Main engines – Shut down.
3. Lighting – All On, except landing lamps.
4. Direct evacuation.
5. Assemble passengers well clear of aircraft (100 metres).

See Operations Manual Vol. 5, Section 5, for full information and procedures after evacuation.
Accident reporting procedure – see Appendix 7, para 7.

HIJACK

It must be accepted that the crew will be unable to prevent the forcible seizure of an aircraft if the safety of everyone on board is not to be jeopardised. A Hijack may occur anywhere and at any time. Each set of circumstances will be different, but it is recommended that where possible the following procedures and advice are observed.

CAPTAIN/FLIGHT CREW

1. Set transponder A7500.
2. Inform ATC.
3. Notices – Seat Belts On.
4. Call CC I/C.
5. Brief crew.

CC I/C/CABIN CREW

1. Inform Captain.
2. Inform remainder of cabin crew.
3. Supervise and reassure passengers.
4. Close bars.

1. Comply with demands without prejudicing safety.
2. Negotiate patiently. Do not antagonise.
3. Ensure comfort of passengers.
4. Maintain communication with Controlling Authorities.

OBJECTIVE – Safe release of passengers and crew.

GENERAL ADVICE

POLICY

PASSENGERS AND CREW COME FIRST – Achieve this by complying with the demands of the hijacker, and avoid conflict on the aircraft.

COMPLY BUT DON'T SURRENDER – It may be possible to persuade the hijacker to modify his demands.

BE GUIDED BY THE AUTHORITIES – Your own assessment of the situation will be constrained by the confines of the aircraft, and the Authorities are bound to have a wider picture; trust their actions, and where possible comply with their instructions.

KEEP THE GROUND AUTHORITIES FULLY INFORMED – Be Observant. They will require the objective and detailed information about the situation on board the aircraft.

DO NOT TAKE INDEPENDENT ACTION – Resist the temptation to 'Have a Go'. Independent action should not be taken except in extreme circumstances, and then only with the Captain's consent. Remember: there may be members of the hijack team who have not revealed their identity.

GENERAL ADVICE (contd)

ATTITUDE

Be open with the hijacker, in respect of operational problems and difficulties.

Try to establish a rapport – detail ONE crew member to deal exclusively with the hijacker.

Don't antagonise or argue.

MAKE THE HIJACKER DO HIS OWN THINKING.

PASSENGERS

Care for the needs of the passengers and keep them informed. Find means of keeping them occupied.

Plan the rationing and distribution of remaining supplies of food and water on the assumption that the incident may be protracted.

NEGOTIATION

IN FLIGHT – Confine negotiations to the aircraft's safe conduct.

AFTER LANDING – Negotiate to obtain the safe release of passengers and crew.

STAY ON THE GROUND IF POSSIBLE.
LEAVE THE AIRCRAFT IF THE OPPORTUNITY ARISES.

EMERGENCY LANDING & EVACUATION

CABIN CREW

1. Captain on cabin address – 'Will the Senior Steward report to the flight deck immediately?'
2. Captain will tell the Cabin Crew i/c the nature of the emergency, his intentions, time available, if Captain or Stewardess is to make emergency announcement, and any other information.
3. The CC i/c will acknowledge by repeating back and inform other cabin crew.
4. Stewardess to warn passengers by cabin address (unless Captain intends to do this), saying:— 'Ladies and gentlemen, this is your stewardess speaking, may I have your attention please? We have an emergency situation and you are requested to follow carefully the instructions given to you by the cabin crew. The Captain is busy at the moment, but will speak to you as soon as possible. Extinguish all cigarettes. Remove all sharp objects from your person – pencils, pens, brooches, tie pins and such like and place in paper bag in front of you.'

IF LANDING ON WATER

Add to cabin address announcement:—

'Loosen all tight clothing, gentlemen loosen neckwear. Remove all shoes. You will find your lifejacket under your seat – remove it, but do not, I repeat do not, inflate it inside the aircraft. If you watch your crew they will demonstrate how to fit the lifejacket.'

Ensure all passenger lifejackets fitted.

5. Instruct passengers:—
   (a) To adjust seat backs to vertical and to fasten seat belts (explain release).
   (b) To fold down centre arm rests, if applicable.
   (c) To take up safety position at blast of whistles –
   If facing forward lean forward and cradle head in arms on knees, feet on floor,
   If facing aft lean back against seat back with arms folded
   – and to remain in this position until the aircraft has stopped.
   (d) To expect more than one bump.
   (e) Which exit to use and alternative.
6. Ensure – exit approaches clear of obstructions,
   slides ready to fit and male passengers ready to help,
   loose equipment and luggage securely stowed,
   tables, including pullman, up or removed,
   pantry electrical appliances off.
7. Check other cabin crew ready, whistles and torches available.
8. Check toilets vacant, crew call lights out.
9. The CC i/c will carry out final seat belt check, and will report to Captain, 'Passengers and aircraft prepared for emergency'.
10. The CC i/c will confirm 'Brace for impact' signal with Captain.
11. When instructed by CC i/c, switch on emergency and Phoenix lights (if fitted), take-up seating position and fasten seat belt or harness.
12. When crew call light comes on, blast on whistles.
13. When aircraft has stopped evacuate passengers (unless otherwise instructed) from exits nearest the ground or away from fire.

For Steward/Stewardess read
Flight Clerk if appropriate

Approved Technical Publication No. 1167
Also reproduced in ATPs 871, 873

CAPTAIN

EVACUATE FROM EXITS NEAREST GROUND OR AWAY FROM FIRE
DIRECT EVACUATION

P2

AS FOR CAPTAIN AND ASSIST EVACUATION

THIRD CREW MEMBER

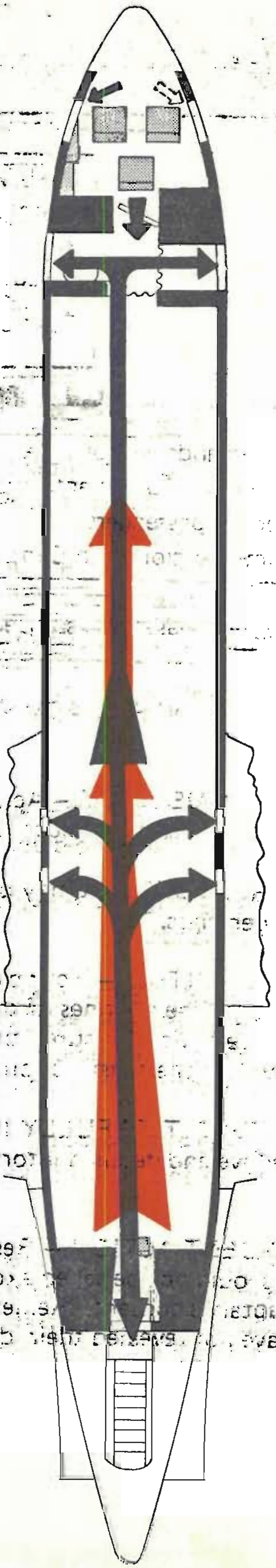
AS FOR P2 AND ASSIST MIDSHIPS

No 3 CABIN CREW FWD OUTBD SEAT

ASSIST AT FWD DOORS AND ESCAPE SLIDES

CHIEF STEWARD FWD INBD SEAT

FWD DOORS AND ESCAPE SLIDES
LEAVE WHEN AIRCRAFT EMPTY



DITCHING

CAPTAIN
P3
CHIEF STEWARD
CC3

DITCHING

P2
CC2

No2 CABIN CREW-REAR DOOR AND WING EXITS UNUSABLE

DIRECT PAX FORWARD

No 2 CABIN CREW – REAR DOOR AND WING EXITS AVAILABLE

VENTRAL AIRSTAIR AND WING EXITS

HIJACK

It must be accepted that the crew will be unable to prevent the forcible seizure of an aircraft if the safety of everyone on board is not to be jeopardised. A Hijack may occur anywhere and at any time. Each set of circumstances will be different, but it is recommended that where possible the following procedures and advice are observed.

CAPTAIN/FLIGHT CREW

1. Set transponder A7500.
2. Inform ATC.
3. Notices – Seat Belts On.
4. Call SCCM.
5. Brief crew.

SENIOR CABIN CREW MEMBER

1. Inform Captain.
2. Inform remainder of cabin crew.
3. Supervise and reassure passengers.
4. Close bars.

1. Comply with demands without prejudicing safety.
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3. Ensure comfort of passengers.
4. Maintain communication with Controlling Authorities.

OBJECTIVE – Safe release of passengers and crew.

GENERAL ADVICE

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ATTITUDE

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PASSENGERS

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NEGOTIATION

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AFTER LANDING – Negotiate to obtain the safe release of passengers and crew.

STAY ON THE GROUND IF POSSIBLE.

For Detailed Policy Refer to Flight Crew Orders.